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The Canadian Journal of Anthropology
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RICHARD FRUCHT MEMORIAL ESSAY PRIZE

The CJA/RCA will award an annual prize in memory of Professor Richard Frucht for an essay of the general topic of historical materialism. While no strict limitations will be placed on the specific area, preference will be given to essays which cover aspects of the following topics which were central to Professor Frucht's scholarly interests: political economy of the nation-state; rural masses and political movements; post slave society in the New World; historical materialism in anthropological theory.

The value of the prize will be $100 for students or $50 for non-students and the winning essay will be published in the CJA/RCA.

Essays should be no more than 5,000 words long and must reach the Editor by the 1st of January. They should conform to the style outlined in the "Notes to Contributors."

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ANNOUNCEMENT

The Mexican Association of Biological Anthropology invites human biologists from Latin America or working in this region to submit titles of papers or symposia they would like to present at the Fourth Biannual Congress. This IV Coloquio de Antropologia Fisica "Juan Comas" is to be held in Mexico City on October 20 - 24, 1986. More information can be obtained by writing to:

ASOCIACION MEXICANA DE ANTROPOLOGIA BIOLOGICA

c/o Instituto de Investigaciones Antropologicas,
Cuidad Universitaria,
Delegacion Coyoacan,
04510 Mexico D.F.,
MEXICO.

Editorial - C.A.P.A/A.A.P.C.

Welcome to the second and final issue in the joint arrangement between the Canadian Association for Physical Anthropology / l'Association pour l'Anthropologie Physique au Canada, and the Canadian Journal of Anthropology / Review Canadienne d'Anthropologie. At the 1985 annual meeting of CAPA/AAPC it was decided that the Canadian Review of Physical Anthropology / Review Canadienne d'Anthropologie Physique would once again become an independent entity. As with Ernest Hemingway, the reports of our demise (as announced in the March 1986 issue of the Palaeopathology Newsletter), are somewhat premature. In again becoming independent, the journal will become involved in one of the new "operant technologies", that which masquarades under the catch phrase of "desktop publishing". Those who are engaged with computers and especially the micro-computing world will recognize this technology as focusing around the Apple Macintosh computer and the LaserWriter printer. By such means, we hope to be able to continue to bring the membership of CAPA/AAPC a quality journal at a bargain price. However, in order to do so, the editorial board will need the active support and contributions of the membership, so keep those papers coming; it is especially efficient if they can be submitted on Macintosh or IBM diskettes!

This issue is one that has had a lengthy gestation, and its "mother" is really Dr Susan Pfeiffer who formulated the initial concept and who performed all of the editorial work in gathering up the papers represented here, having them reviewed, and polishing them into final shape. The entire mass was then turned over to me for the purposes of production, and Susan has proceeded on to other projects. My part has, in the year that the material has been with me, been the joys of copy editing, the input of material into the computer, by means of the optical character reader where possible, via conversions from other computer formats, and when desperation forced, the thrill of typing in many pages of text and tables. In this latter activity, I have had some aid from graduate students Ingrid Tenor and Eileen Delman, as well as one of my secretaries, May Ives. Without their aid, I might have been still tapping away at Easter.

In many ways, the efforts of Dr Pfeiffer and her team of authors have achieved a high water mark in Canadian physical anthropology. For the first time, our discipline has presented an extensive picture of the biology of the population of a region of Canada from the dark and misty antiquity of the earliest inhabitants, through to the thriving nations that greeted the first European explorers. In that achievement, I perceive a developing maturity within the field, and a glow of healthy vigour in the discipline. As many of us have noted, physical anthropology in Canada has had a long childhood and is very diversified, but it is now entering a more mature phase. I hope that the Review, and the new newsletter under the leadership of Dr Francis Forest of the Université de Montréal, will continue to aid and encourage that development.

The next issue of the Review has already begun to take some form, and I hope to be able to force the gestation period down to six months or so. The papers will centre around the changing methodologies in physical anthropology, and will include both of the winners of the Oshinsky-McKern awards, the student papers, from the 1985 meetings. I hope that it will prove to be an especially provocative issue, resulting in even more stimulating submissions in the future.

Finally, I wish to thank the good people of the CJA/RCA at the Anthropology department of the University of Alberta for their good will and encouragement during these past two years. I especially wish to thank Roslyn Madrid and Jean Strong, who have been my most frequent contacts, and the senior editors of the CJA/RCA, Regna Darnell, David Lubell, and Alan Bryan for their understanding that I may not always meet the timetables that I originally hoped I could.

Editor / Redacteur
James D.Paterson

OBITUARY

MELISSA J. KNAUER (December 19, 1953 to June 16, 1985)

Dr B.A.Sigmon
Department of Anthropology
University of Toronto

The untimely death of Melissa J. Knauer on June 16 in Botswana has left a vacuum in the lives of the many students, colleagues, and friends who knew her. Melissa and one other person of an 8 member field research party were killed in a vehicle accident while travelling to the Dobe area of northwestern Botswana. A team of 4 anthropologists were planning to carry out research on aging, caregiving, and social change among the San of the Dobe region. The field project was unfortunately abandonned because of the tragic accident which killed 2 and injured other members of the party.

The shock of this tragedy has been felt with deep sadness by members of the Department of Anthropology at the University of Toronto where Melissa had just completed her graduate work and her doctoral thesis.

Melissa came to the University of Toronto in 1976 after completing her B.A. degree at Pennsylvania State University in 1975. She had spent a year as Research Technician at the Field Facility of the Yerkes Regional Primate Research Centre in Atlanta, Georgia (1975-76), and began graduate work at Toronto in the fall. In 1977 Melissa completed her M.A. and in October of 1984 she successfully defended her Ph.D dissertation entitled *Breastfeeding Patterns and Postpartum Fertility in Urban Canadian Women.* The research that she carried out in this area contributed significantly to the literature on breastfeeding and on factors involved in the resumption of postpartum menstruation and ovulation. Melissa had also been involved in non-human primate research, including field work, at the Yerkes Primate Research Centre in Atlanta, and a study of the mating patterns of the Barbary macaques (Macaca sylvanus) in Gibralter (1980).

While a graduate student , Melissa was a teaching and /or laboratory assistant in a variety of anthropology courses. Because of her excellent teaching reputation, she was given the opportunity to teach an introductory anthropology course in 1984. As a teacher, she was well liked and respected by her students; her evaluations were always superb. She had the ability to instill in her students a hungry enthusiasm to learn and to perform at high levels.

Also active in student affairs, Melissa was Secretary of the Anthropology Graduate Student Union in 1978/79, and President in 1979/80. She was extremely active in supporting feminist research in Anthropology. A scholarship fund entitled the Melissa J.Knauer Memorial Fund for Feminist Research in Anthropology, has been set up at the University of Toronto for purposes of aiding those students conducting research in a field that Melissa considered to be extremely important.

While still a graduate student, Melissa began presenting papers at symposia and conferences, including the following:

1978 Hudson Symposium on Biosocial Mechanisms of Population Regulation, State University of New York, Plattsburgh, New York.

1980a "Affiliative Behaviour in *Macaca sylvanus*: 1. Genealogical Relationships", F.D.Burton, M.Brackley, M.Knauer, and C.Underwood. Presented at the 49th Annual Meeting of the American Association of Physical Anthropology, Niagara Falls, New York.

1980b "Breastfeeding and Postpartum Ovulation: A Research Design". Presented a the 8th Annual Meeting of the Canadian Association for Physical Anthropology, Ottawa Ontario. An Honourable Mention was received for this presentation.

1981 "Breastfeeding and the Resumption of Postpartum Ovulation in Urban Women". Presented at the 50th Annual Meeting of the American Association of Physical Anthropology, Detroit, Michigan.

1982a "Breastfeeding, Postpartum Fertility and the Sympto-thermal Method". Presented at the Infertility/ Fertility Conference, Toronto General Hospital, Toronto, Ontario.

1982b "Breastfeeding and Postpartum Fertility". Presented at the 10th Annual Meeting of the Canadian Association for Physical Anthropology, Guelph, Ontario.

1983 "Breastfeeding and Postpartum Fertility in Canadian Urban Women". Presented at the 52nd Annual Meeting of the American Association of Physical Anthropology, Chicago, Illinois.

1985a "Breastfeeding Patterns and the Resumption of Postpartum Menstruation in Urban Canadian Women". Presented at the 54th Annual Meeting of the American Association of Physical Anthropology, Knoxville, Tennassee.

1985b "Infant Feeding Practises and Natural Mothering in Urban Canadian Women". Presented at the Canadian Ethnological Society Meetings, Toronto, Ontario.

An active member of professional organizations, she belonged to and participated in the following: American Anthropological Association, American Association of Physical Anthropology, Canadian Association for Physical Anthropology, Canadian Research Institute for the Advancement of Women, and the Human Biology Council.

Her publications include:

1981 "Breastfeeding and Postpartum Ovulation: A Research Design". Canadian Review of Physical Anthropology, 3(1): 44-54.

1983 "Postpartum Fertility and Breastfeeding". Antaeus: Anthropology Graduate Student Journal, University of Toronto, Vol. 1, April, pp. 35-39.

1984 "Natural Mothering in Urban Canadian Women". Antaeus: Anthropology Graduate Student Journal, Vol. 2, In TABOO: Special Feminist Edition, April, pp.10-17.

(in press) "Determinants and Correlates of the Return of Menstruation in Nursing Mothers Following 'Natural Motherhood'". *In* Breastfeeding, Child Health and Child Spacing: Anthropological Insights, V.Hull and M. Simpson-Hebert, eds., Croom-Helm Publishers.

Melissa was one of those rare people who was blessed with such a fullness of life that her vitality and dynamism, combined with her extremely compassionate nature, made her a singularly extra-ordinary person. She was a doer, a giver, a person so full of life that the waves of energy that she generated in so many areas and through so many people, will continue to be felt as actively moving ripples for a long, long time. Both the world of anthropology and the people she knew and would have known have lost a glowing star just as it was beginning to shine at its brightest.

PREHISTORIC PEOPLE OF SOUTHERN ONTARIO: AN INTRODUCTION

S. PFEIFFER
School of Human Biology
University of Guelph.

This collection of papers represents an attempt to document how skeletal biologists have approached prehistoric human skeletal material from Ontario, and what we have learned to date. As documentation, it is incomplete. The studies focus on the Iroquoian-speaking populations of Southern Ontario and their predecessors. But they should demonstrate to the reader the potential and realized value of incorporating the study of skeletal material into the study of prehistory.

The geographical region discussed here roughly parallels 'upper Canada': from the home of the St. Lawrence Iroquois near what is now Montreal, west to the Great Lakes. The region includes the ecologically attractive environments of the Niagara Peninsula, Huronia, and southwestern Ontario. The region currently supports over eight million people and much economic acitivity with the concomitant archaeological opportunities (for salvage and otherwise).

Humans appear to have entered this region from the south after the final retreat of Pleistocene glaciation, between 7000 and 11,500 years ago (Storck 1984). The oldest dated human skeletal material is Archaic, with a radio-carbon date of 5910 ± 165 BP (the Milton-Thomazi Site, Katzenberg and Sullivan, 1979). Later Archaic skeletal material, representing the Old Copper, Glacial Kame, and Red Ocher burial complexes is rarely found but is represented from one end of the region to the other (Pfeiffer, 1977, and Spence, this volume). Individual interments and cremations typify this period. Subsequent Woodland cultures (Meadowood, Point Peninsula, Saugeen, and Western Basin) are occasionally represented by relatively small skeletal samples. These too tend to be individual interments except for foci of mound building in east central Ontario and the Niagara Peninsula (Spence and Fox, 1985). Then, around 1300 AD, across much of the region, skeletal remains begin to be organized into ossuary-like groupings, a diagnostic trait of traditions known as Ontario Iroquois in the eastern part (Wright, 1972). Southwestern Ontario (historic home of the Neutrals) does not yield ossuaries until much later. By historic times, ossuary pits were constructed to hold the remains of several hundred individuals. Their size, plus the ethnographic documentation of Iroquoian culture provided by early explorers and missionaries, have helped to focus attention on these large ossuary samples (see Molto, 1983 for a history of the studies).

In a discussion of prehistoric Iroquoian social and political organization, B.G.Trigger has noted:

> Few [social and political] problems can be understood on their own terms. Instead, they must be investigated in a holistic manner that takes account of the relationship of what is being investigated to the total patterns of Iroquoian cultures and their historic development. (1981:40)

Certain aspects of this "total pattern", be it that of an Iroquoian population or an earlier group, are best studied through the analysis of skeletal remains. Using examples of noted ethnographic importance, osteological studies offer critical information regarding:

- Population relationships through time (biological characteristics reflecting displacement and mating patterns).
- Shifts in patri-matrifocality.
- The maintenance of differential status.
- Demographic changes, including the composition of the total population and subsets of that population. And, related to population composition,
- The timing and impact of epidemics and warfare.

The papers collected here have something to add to all these identified research areas. But they represent attempts to do more than assist our fellow anthropologists in answering questions of mutual interest. They also represent the need for skeletal biologists to amass basic, descriptive information about prehistoric people surviving and adapting to their environment. We need such a descriptive base for two reasons: to identify meaningful change when it occurs (the introduction of corn to the diet, for example) and to quantify biocultural adaptation through time. Biologically speaking, we know that prehistoric people in Ontario survived to face the Europeans and greet the historic period. We do not know nearly enough about how they did it.

If readers of these papers concur that the study of skeletal material offers information that is both relevant and unique, another point logically follows: skeletal evidence of prehistoric people has great scientific value. It is a public resource to be held in respectful trust for the benefit of all people. It seems to surprise people when they are told that skeletal biologists do their work out of respect for the people these bones represent. Those of us with the appropriate, specialized training have a social obligation to help native peoples learn as much as possible about their ancestors, and many historically relevant facts can be deduced best from skeletal remains. We need to find effective, efficient vehicles for communicating the results of our work. We are studying nothing less than a piece of the natural history of humankind. Our work is relevant to native people, to Ontarians, and to people from anywhere who wonder how our species has survived thusfar.

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CHANGES IN ORAL HEALTH AMONG PREHISTORIC ONTARIO POPULATIONS

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Abstract: This study was conducted to evaluate the oral health of Pre-Iroquoian and Iroquoian populations from southern Ontario. A battery of dental pathological and attritional status characteristics is used to investigate the similarities and differences in dental health among three southern Ontario skeletal samples, each chosen because it falls into a critical period of Ontario prehistory. The samples include: LeVesconte Mound whose temporal setting is just prior to the emergence of effective maize horticulture; the Bennett site, dating just prior to the Middle Ontario Iroquois cultural horizon, during which time some investigators suggest that the Ontario Iroquois became heavily dependent upon maize horticulture; and Kleinburg ossuary, which is representative of a late proto-historic Ontario Iroquois population.

The dental conditions analyzed include tooth status, occlusal attrition. caries, alveolar abscesses, periodontal disease, enamel hypoplasia, and antemortem tooth trauma. Results demonstrate that LeVesconte Mound differs significantly from the Bennett and Kleinburg samples in tooth loss, attrition, caries, and tooth trauma, while there are many similarities for other dental conditions. including alveolar abscessing, and periodontal disease. Bennett and Kleinburg show close similarities for almost all dental characteristics, the only major differences being for enamel hypoplasia and tooth chipping.

Results of an expanded inter-site comparison of dental conditions of the Ontario Pre-Iroquois and Iroquois show that samples can be seriated on the basis of certain patterns of dental characteristics. Middle Woodland populations are characterized by a low tooth loss, moderate to severe attrition, low levels of caries, and substantial tooth trauma; those from the beginnings of the Late Woodland period display moderate tooth loss, moderate attrition, moderate to high caries, and moderate tooth chipping; and proto-historic Iroquoian samples show high tooth loss, low to moderate attrition, rampant caries, and low to moderate tooth chipping.

Résumé: Cette étude avait pour objet d'évaluer la santé bucco-dentaire des populations préiroquoises et iroquoises du Sud ontarien. On s'est servi d'un ensemble de caractéristiques de l'état pathologique et du degré d'ususre des dents pour déterminer les ressemblances et les différences en matière santé dentaire entre trois groupes de squelettes du sud de l'Ontario, choisis parce que chacun d'eux correspond à une période décisive de la préhistorie de l'Ontario. Source des échantillons: LeVesconte Mound, occupé juste avant l'apparition d'une véritable culture du mais; site Bennett, qui précède immédiatement l'horizon culturel moyen des iroquoise ontariens, époque à laquelle, selon certains chercheurs, les iroquoise de l'Ontario auraient commencé à dépendre dans une large mesure de la culture du mais; et ossuaire du Kleinburg, représentatif de la population iroquoise de l'Ontario à l'époque protohistorique recénte.

Les caractéristique dentaire analysées comprenaient: état des dents. attrition occlusale, caries, abscès alvéolaires, paradontolyse, hypoplasie de l'émail, traumatisme dentaire antemortem. Les conclusions ont montré que l'échantillion de LaVesconté Mound est très différent de ceux des sites Bennett et Kleinburg en ce qui concerne la perte des dents antemortem, les traumatismes dentaires antemortem, l'attrition occlusale, et les caries, tandis qu'on trouve de nombreuses ressemblances concernant d'autres caractéristiques dentaire, comme similitudes comme les abcès alvéolaires et la paradontolyse. Les deux derniers site montrent d'étroites similitudes pour presque toutes les caractéristiques et ne présentent des différences importantes que pour l'hypoplasie de l'émail et l'ébrechure des dents antemortem.

Les resultats de la comparison entre les sites des caractéristiques dentaires des préiroquoise et iroquoise de l'Ontario ont montré que l'on puet classer les echantillons d'aprés certains ensembles des caractéristiques. Les populations du stade syvicole moyen se caractérisaient par une petit nombre de pertes de dents antemortem, une attrition occlusale modérée ou grave. Peu de caries et d'importants traumatismes dentaires; celles du début du stade syvicole récent montraient une perte de dents moyenne antemortem, une attrition occlusale moyenne, un nombre moyen ou élevé de caries et un nombre moyen d'ébréchures dentaires antemortem; enfin, les specimens d'iroquoiens protohistoriques révélaient une important perte de dents antemortem, une attrition occlusale faible ou moyenne, des caries généralisées et un nombre faible ou moyen d'ébréchure dentaire antemortem.

Key Words: **Oral Health, Maize Horticulture, Ontario Prehistory, Seriation.**

INTRODUCTION

The Ontario Iroquois were the result of long term cultural and biological developments in southern Ontario and adjacent areas of New York State. It has only been in recent years that a substantial understanding of some of the processes which shaped the development of the Ontario Iroquois has been acquired. The *in situ* theory of Iroquois origins, first documented by R. S. MacNeish (1952) has gained support from archaeological investigations over the past 30 years. This has provided a model with which to view the dynamic processes which shaped the evolutionary history of the Ontario Iroquois.

The health of a population reflects its general condition and growth, and offers valuable insight into the nature of the society. Wells summarized this by saying:

> The patterns of diseases and injury that affect any group of people is never a matter of chance. It is invariably the expression of the stresses and strains to which they were exposed, a response to everything in their environment and behaviour. It reflects their genetic inheritance (which is their internal environment), the climate in which they live, the soil that gave them sustenance, and the animals or plants that shared their homelands. It is influenced by their daily occupations, their habits of diet, their choice of dwelling and clothes, their social structures, even their folklore and mythology. (1964: 17).

The oral health of a population is intimately related to its particular subsistence base and dietary habits. An examination of the incidence of oral diseases in the dentition of a person or population may illuminate much about their ways of life, even in the absence of cultural evidence (Brothwell, 1963: Wells. 1964). Previous investigations have shown that prehistoric diet can be estimated on the basis of oral health (e.g. Leigh, 1928; Goldstein, 1948; Hardwick, 1960: Moore and Corbett, 1971, 1973; 1975; Ryan, 1977; Turner, 1978: Patterson, 1984). The approach follows the classic demonstration by Leigh (1925) that there is a high correlation between certain patterns of dental pathology and attrition and the subsistence base of populations. For example, populations practicing a fishing/hunting and gatherinq economy are in broad terms characterized by pronounced attrition, periodontal disease. and abscessing, and a low incidence of caries: while populations practicing a horticultural economy are characterized by low to moderate attrition, moderate periodontal disease, high antemortem tooth loss, and high levels of caries.

Several previous investigators have suggested that certain patterns of dental conditions characterized the various developmental stages of the Pre-Iroquois and Iroquois in southern Ontario. Knowles (1939) was the first to suggest that differences in the incidence of dental conditions between prehistoric Ontario Iroquois groups and earlier Mounds peoples were due primarily to differences in dietary adaptation. Anderson (1968) outlined the importance of dental differences as a means of relating skeletal samples to their subsistence base in his study of the Serpent Mounds materials. The fact that distinct differences in the subsistence economies of various cultural groups from the Archaic and Woodland periods have been demonstrated archaeologically, allows one to utilize certain dental characteristics of skeletal samples to place various samples within the development sequence (Molto, 1975; Patterson, 1979, 1984).

Certain basic trends can be identified which characterize the changing total patterns of the developmental periods of Ontario prehistory (Patterson, 1979, 1984). Archaic populations, whose subsistence was based heavily upon fishing/hunting and gathering, are characterized by heavy attrition, abscessing, periodontal disease, and an almost complete absence of caries. There were very few changes during the Early and Middle Woodland periods, except that there were now low levels of caries. By the beginnings of the Late Woodland period the subsistence pattern had changed to semi-horticulture combined with hunting and gathering. The dental health of these populations involved moderate levels of attrition, increased frequency of antemortem tooth loss. and moderate incidences of caries and periodontal disease. These trends continue into the Late Ontario Iroquois stage which is characterized by low levels of attrition. high periodontal disease and antemortem tooth loss, and rampant caries.

A diagnostic characteristic of the Woodland period is the transformation from a fishing/hunting and gathering economic base to a horticultural subsistence pattern which by protohistoric times provided up to 75 percent of the food eaten (Heidenreich, 1963, 1971, 1972; Trigger, 1978; Tuck, 1978). The acquisition of maize horticulture by indigenous Middle Woodland peoples is of major importance in Ontario prehistory. Present evidence suggests that the introduction of maize horticulture had a revolutionary effect, resulting in a widespread and fairly rapid shift toward a horticultural subsistence pattern and a more sedentary village life among the Iroquoian-speaking peoples of the region. (Ford, 1974; Noble, 1975a; Trigger, 1976; Tuck, 1978). The focus of current research on the adoption of horticultural subsistence by peoples of southern Ontario concerns both the timing and geographic location of the entry of maize into the area. There is some controversy as to whether once maize horticulture was introduced it took hold rapidly or was gradually adopted over a substantial period of time. Some feel that the development of horticulture was a lengthy and continuous process and that heavy reliance upon horticulture only occurred by Middleport times (circa A.D. 1350 to 1400) (Caldwell, 1958; White, 1963: Wright, 1966). Others suggest that the introduction of maize horticulture had a revolutionary effect from at least A.D. 500 (Ford, 1974; Noble, 1975b; Trigger, 1976; Tuck, 1978).

The settlement-subsistence patterning of the final phase of Princess Point (Stoffers, 1977; Tuck, 1978) and the heavy dependence upon maize horticulture by early Glen Myer cultures (Noble, 1975b) argues strongly for heavy reliance upon maize horticulture. Ritchie (1969) notes that the subsistence economy of Late Point Peninsula peoples probably included cultigens which were regularly being selected since there is reliable archaeological evidence for maize production in a Hopewellian context (Griffin, 1960). Initially, wild rice (*Zizania aquatica*) may have been grown as a semi-horticultural product (Aller, 1954; Yarnell, 1964). One motivation for experimentation with maize horticulture was a desire to find a new source of food which could be stored to sustain a semi-sedentary population (Trigger, 1976; 1978). The advantages maize had over rice was that it could be grown in a wider range of ecological zones and the dangers of crop loss are less. Thus, it is probable that incipient maize horticulture was introduced into southern Ontario sometime during the era of A.D. 300 to A.D. 500.

It has been difficult to quantify the growing dependence on maize horticulture through time from archaeological data, in part because maize remains are only accidently preserved in village middens. However, analysis of the oral health of populations should provide valuable insights into this problem since it is intimately related to their particular subsistence base and dietary habits. Caries have been shown to be strongly associated with the amount, type, and adhesiveness of the carbohydrate portion (Turner, 1978) and can therefore be used to assess the dietary intake of carbohydrates in a given population sample.

MATERIALS AND METHODS

Materials

This study was undertaken to evaluate the oral health of Pre-Iroquois and Iroquois populations from southern Ontario. A battery of rigorously documented and standardized dental pathological and attritional status characteristics was utilized to investigate the similarities and differences in dental health among three southern Ontario skeletal samples, each chosen because it is from a critical period of Ontario prehistory. The samples include: LeVesconte Mound whose temporal setting is just prior to the emergence of effective maize horticulture (circa third century A.D.); the Bennett site, dating just prior to the Middle Ontario Iroquois cultural horizon (late thirteenth century A.D.), during which time some investigators suggest that the Ontario Iroquois became heavily dependent upon maize horticulture (e.g. Noble, 1969, 1975b; Wright, 1966, 1972; Tuck, 1978); and the Kleinburg ossuary, which is representative of a late proto-historic Ontario Iroquois population (approximately A.D. 1600).

The analysis of dental conditions in each sample was based upon the following skeletal materials. From LeVesconte Mound there are 53 single and multiple burials representing 31 adults with 14 males, seven females, and ten of indeterminant sex, and 22 immature specimens. There are 14 individuals from Bennett site, eight adults with four males and three females and six subadults. A minimum of 746 individuals [1] are represented by the Kleinburg ossuary dental materials ranging from complete specimens with most teeth intact to fragments with only a few tooth sites present. The sample includes 1,145 maxillary specimens (five burials, 69 skulls and 1,071 maxillary fragments) and 956 mandibular specimens (eight burials and 948 mandibular fragments). Of the 2,101 specimens, 539 are subadult. Table 1 summarizes the number of deciduous and permanent teeth examined in each sample.

TABLE 1

Total numbers of teeth and tooth sites observed among deciduous and permanent dentitions from LeVesconte Mound, Bennett Site, and Kleinburg Ossuary

	Decuduous Dentition		Permanent Dentition	
	Teeth	Tooth Sites	Teeth	Tooth Sites
LE VESCONTE MOUND				
Maxilla	88	128	211	288
Mandible	112	197	213	373
Totals	200	325	424	661
BENNETT SITE				
Maxilla	33	38	69	95
Mandible	37	42	101	140
Totals	70	80	170	235
KLEINBURG OSSUARY				
Maxilla	372	1049	1798	6435
Mandible	73	630	1620	7657
Totals	445	1679	3418	14,092

Methods

Dental characteristics utilized to investigate the oral health of these samples include: antemortem tooth loss, attrition, caries, alveolar abscessing, periodontal disease, antemortem tooth trauma, and enamel hypoplasia. All specimens were assessed for the conditions of the teeth in the dental arch. Antemortem tooth loss was defined as any instance where there was evidence of osseous healing or resorption of the alveolus.

Attrition, involving a progressive wearing away of occlusal surfaces of teeth during normal masticatory processes, was scored following Molnar (197la, 197lb) with the addition of the level of "small dentine patches with the cusp pattern not obliterated" as suggested by Hall (1976:75). Levels one and two of Molnar were reassigned to levels zero and one respectively, with Hall's 2.5 level being assigned level two.

Caries is a complex multifactorial disease involving the progressive destruction of dental substances by microbial organisms. A carious lesion was recognized as a macroscopic necrotic defect of tooth surfaces and was scored by surface involvement. The incidence of caries is reported by totals and surface involvement. The location (surface) is important because it allows one to study the intensity of caries within the dentition. Alveolar abscessing is a pathological condition characterized by periapical destruction of alveolar bone caused by various infectious conditions. It was scored for any bone destruction associated with a potential tooth site involving bone degeneration with or without a fistulous tract following Alexandersen (1967) and, to a lesser extent, Leigh (1925; 1928). Periodontal disease involves an inflammation and degeneration of the periodontium. It involves two separate but interrelated areas within the periodontium, the gingiva and the attachment apparatus, including the alveolar bone. It was scored on a scale of 0 for a normal alveolus, 1 for interdental bone loss between adjacent teeth, 2 for bone loss down toward the root bifurcation, and 3 for bone loss beyond the bifurcation area for a tooth site following Beagrie et al. (1970).

Antemortem tooth trauma involves injury to tooth substance by external agents, such as mechanical injury. Several types of macroscopic injuries may affect the tooth crown. The two most common forms include chipping, involving the loss of small chips of enamel from the occlusal edges of teeth and fracturing, involving the loss of substantial portions of tooth substance. A study of the type, extent, and distribution of tooth trauma within the dentition provides evidence as to the amount of grit in the diet, as well as giving insight into the forces and frequency of tooth contact. Surface features of rounded edges, scratching of facets, and shine of the enamel and/or dentine was utilized to differentiate antemortem from postmortem trauma.

Enamel hypoplasia provides a permanent record of the type and intensity of environmental stresses and metabolic insults affecting the growth of an individual from birth to about age 15. A number of factors may play a role in differences in the chronological distribution of enamel defects, including cultural factors, such as the age at weaning and the type of weaning diet: as well as nutritional and disease stresses (Rose, 1977; Cook and Buikstra, 1973). Recently, Nikiforuk and Fraser (1981:892) hypothesize that "chronic diarrhea causes malnutrition which is reflected in hypocalcemia, which in turn results in linear enamel hypoplasia". therefore, the presence of enamel hypoplasia in a subject is prime evidence that hypocalcemia was present at the time the defective zones were developing. All teeth were scored for the presence of hypoplastic pits and grooves following Patterson (1984).

RESULTS

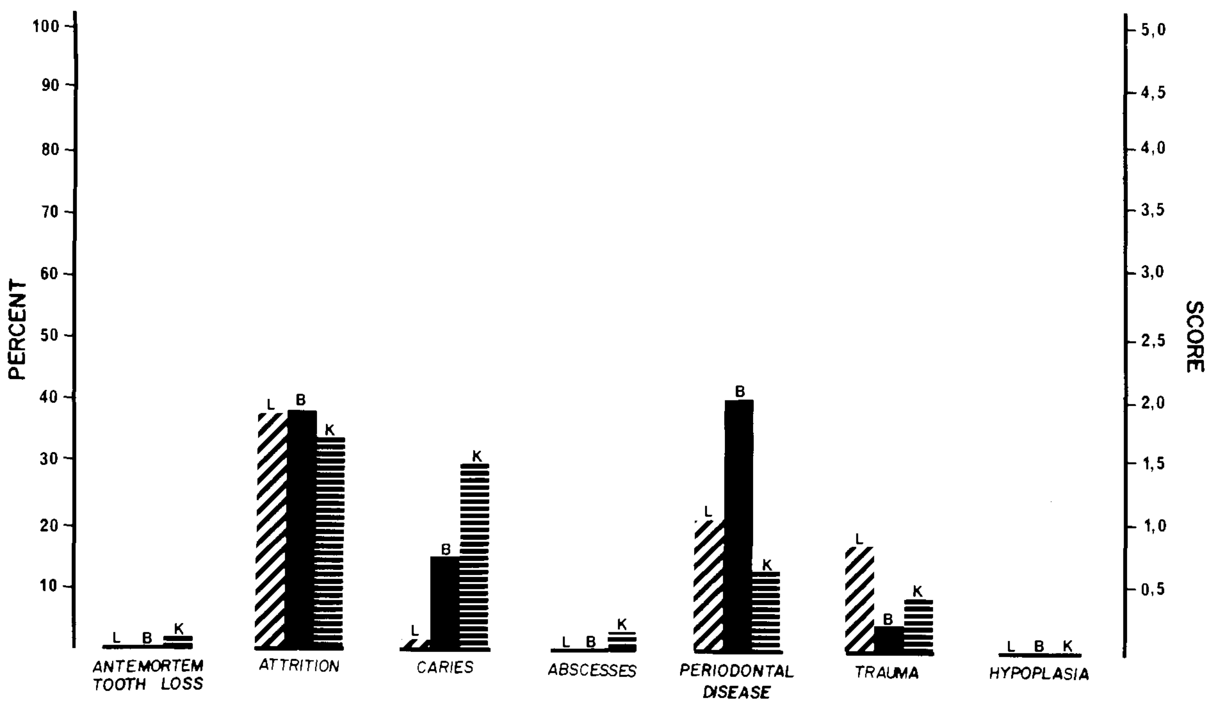
The patterns of dental conditions which characterized the LeVesconte Mound, Bennett site, and Kleinburg ossuary deciduous and permanent dentitions are summarized in Tables 2 thru 5 and are illustrated in Figures 1 and 2. The presence of moderate to severe attrition, substantial antemortem tooth trauma, low antemortem tooth loss, and moderate alveolar abscesses for LeVesconte Mound indicates a people who had a fishing/hunting and collecting subsistence base. Additionally, the moderate level of caries observed among the permanent teeth is suggestive of a people who may have been incipient horticulturalists. Thus, these people had a subsistence economy based upon hunting, fishing, and gathering, with a moderate amount of carbohydrate included in the diet.

The Bennett site dentitions display the presence of low to moderate attrition, low antemortem tooth trauma, moderate antemortem tooth loss, moderate numbers of alveolar abscesses, and high levels of caries. These dental characteristics indicate that the Bennett people had a fully developed horticultural economy. Additionally, the presence of moderate attrition indicates that gathered food products played a small but significant role in their diets.

The presence of low to moderate attrition, low antemortem tooth trauma, high antemortem tooth loss, moderate alveolar abscesses. and rampant caries among the Kleinburg ossuary dentitions suggests that these people had a highly developed horticultural economy. Furthermore, the very high incidence of caries indicates that maize was the major dietary staple.

Analysis of antemortem tooth loss reveals much about the dental health of a population. Although one cannot be certain of the exact cause of the loss, analysis of antemortem loss provides an indication of the intensity of dental disease in a population. The overall incidence in

Fig. 1 Comparison of the incidences of selected oral diseases and occlusal attrition of the deciduous dentitions among LeVesconte Mound (L), Bennett site (B), and Kleinburg ossuary (K).



the permanent dentitions ranges from a low of 8 percent in the LeVesconte Mound sample to a high of almost 19 percent in both horticultural groups (see Table 2). The antemortem loss among LeVesconte Mound material reflects pulp exposure due to attrition, as well as periodontal disease, while losses among the other samples are indicative of the intensity of caries and periodontal disease. Among Levesconte Mound material there is a very low loss among the anterior teeth. Bennett and Kleinburg are similar in the incidences of antemortem loss, with the canines showing the lowest incidence and the molars the highest. When the jaws are considered separately, there is a higher incidence among mandibles for all samples.

Eight cases of antemortem tooth loss were observed among the Kleinburg deciduous dentitions. Although there are no statistically significant differences among the samples ($\chi^2 1.94$ with $p = .38$), it is still functionally significant because one rarely observes tooth loss among the dentitions of small children.

Overall, the Levesconte Mound dentitions display moderate to severe occlusal attrition, while the two Iroquoian groups show evidence of low to moderate wear. For all three groups, attrition is greater in the permanent than in the deciduous dentition (see Tables 6.4, 7.4, and 8.5 in Patterson, 1984 for details).

Occlusal attrition of the deciduous teeth involves slight to moderate wear in all samples. In general terms, attrition is greatest among LeVesconte Mound, while Kleinburg shows the least amount of wear. When the jaws are considered separately, attrition is slightly greater among the maxillae.

Occlusal attrition in the permanent dentition involves moderate to severe wear among the LeVesconte Mound sample, while attrition among the Bennett and Kleinburg dentitions involves only moderate wear. In general terms, Kleinburg displays the least attrition, while the greatest wear is seen among the LeVesconte Mound dentitions. When the jaws are considered separately, occlusal wear is more marked in the mandible for all samples. Bennett and Kleinburg show a posterior decrease in the level of attrition, while LeVesconte Mound molars are more worn than the premolars. Another noteworthy feature is an almost two fold difference in wear between incisors and

TABLE 2
Incidence (%) of antemortem tooth loss among deciduous and permanent dentitions from selected southern Ontario samples.

	LeVesconte Mound	Bennett Site	Kleinburg Ossuary
DECIDUOUS DENTITION			
Maxilla	0	0	0.7
Mandible	0	0	0.2
Both Jaws	0	0	0.4
Incisors	0	0	0.3
Canines	0	0	0.2
Molars	0	0	1.0
PERMANENT DENTITION			
Maxilla	5.2	16.8	15.4
Mandible	10.2	20.0	21.2
Both Jaws	8.0	18.7	18.5
Incisors	2.9	12.5	11.4
Canines	0	4.2	7.4
Premolars	8.4	12.5	14.9
Molars	12.0	28.0	29.1

Fig. 2 Comparison of the incidences of selected oral diseases and occlusal attrition of the permanent dentitions among LeVesconte Mound (L), Bennett site (B), and Kleinburg ossrary (K).

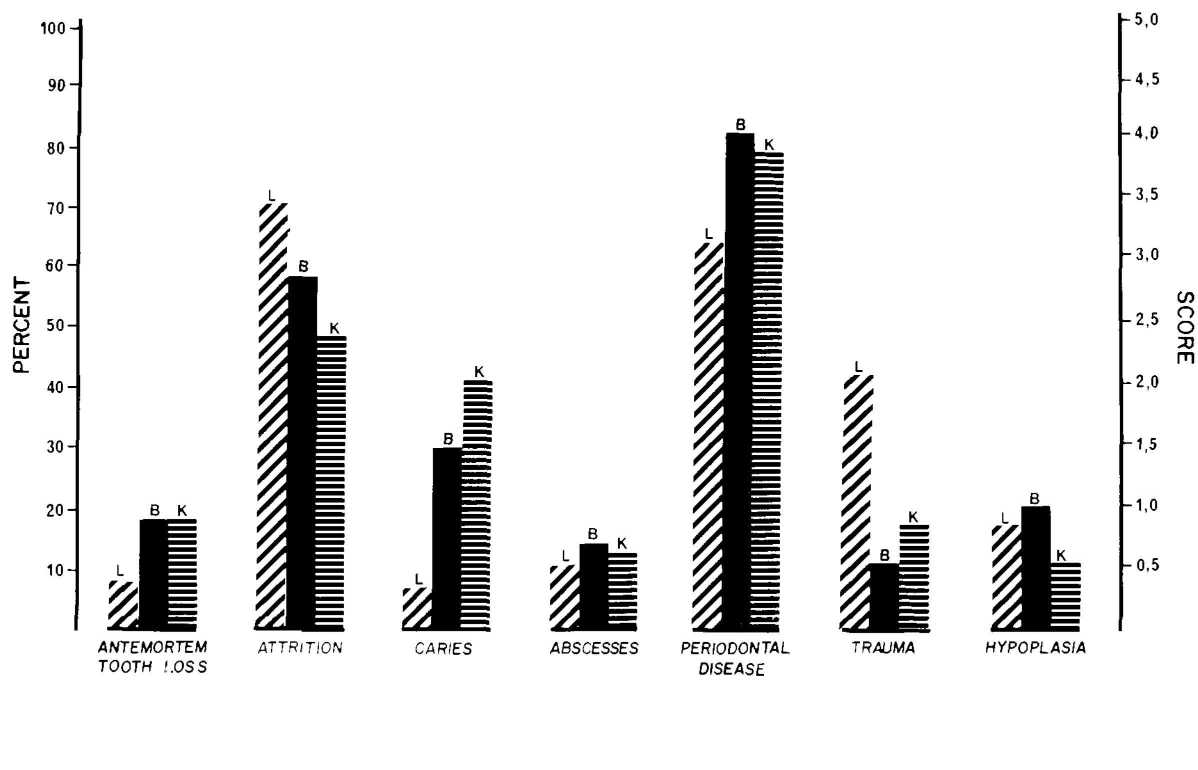


TABLE 3
Incidence (%) of dental caries by tooth and surface involvement among deciduous and permanent dentitions from selected southern Ontario samples

	Levesconte Mound	Bennett Site	Kleinburg Ossuary
BY TEETH:			
Deciduous Dentition			
Maxilla	2.4	3.2	28.0
Mandible	0	22.9	35.5
Both Jaws	1.1	13.6	29.2
Incisors	0	4.5	0
Canines	0	8.3	0
Molars	2.0	21.9	31.3
Permanent Dentition			
Maxilla	8.4	35.5	42.0
Mandible	4.4	26.4	38.9
Both Jaws	6.5	30.2	40.6
Incisors	0	7.1	8.7
Canines	2.2	14.3	15.1
Premolars	3.4	27.5	25.9
Molars	13.3	60.0	52.9
BY SURFACES:			
Deciduous Dentition			
Maxilla	0.5	1.1	4.3
Mandible	0	3.8	4.7
Both Jaws	0.3	2.5	4.4
Incisors	0	0.7	0
Canines	0	4.0	0
Molars	0.4	3.5	4.7
Permanent Dentition			
Maxilla	1.7	10.4	7.4
Mandible	0.9	13.2	6.3
Both Jaws	1.4	12.0	6.9
Incisors	0	2.9	1.9
Canines	0.2	7.9	2.9
Premolars	0.5	14.2	5.1
Molars	3.0	20.7	8.6

molars among the Iroquoian groups, and only small anterior-posterior differences for LeVesconte Mound. Thus, one major differentiation between these groups is the increased occlusal wear of the posterior dentition from LeVesconte Mound in contrast to the lower levels of wear among the later horticultural groups. This indicates that there was a substantial decrease in attrition through time.

The two Iroquoian samples display a high incidence of caries, while it is low among the LeVesconte Mound dentitions. Table 3 presents the distribution of caries by tooth and surface involvement. Within the deciduous dentition, the overall incidence ranges from a low of 1.1 percent for LeVesconte Mound to a high of 29.2 p ercent for Kleinburg. The maxilla displays a higher incidence for Levesconte Mound, while the opposite is true for the horticultural groups. This indicates that there is a substantial increase in the incidence of deciduous caries through time. The molars contribute heavily to this differentiation since there are few differences anteriorly. The overall incidence by tooth surface is low among the LeVesconte Mound sample (0.3 percent) and highest for Kleinburg (4.4 percent).

The overall incidence of caries among the permanent dentitions ranges from a low of 6.5 percent for LeVesconte Mound to a high of 40.6 percent for Kleinburg. There is a progressive posterior increase in caries incidence. The maxillary dentitions of all samples show higher incidences of caries lesions. The overall incidence of caries by tooth surface in the Permanent dentition ranges from a low of 1.4 percent for LeVesconte Mound to a high of 12.0 percent for Bennett, while Kleinburg is intermediate at 6.9 Percent. There is a posterior increase in carious surface involvement.

TABLE 4
Incidence (%) of alveolar abscessing among deciduous and permanent dentitions from selected southern Ontario samples.

	LeVesconte Mound	Bennett Site	Kleinburg Ossuary
Deciduous Dentition			
Maxilla	0	0	1.7
Mandible	0	0	0.4
Both Jaws	0	0	1.3
Incisors	0	0	0
Canines	0	0	0.3
Molars	0	0	3.8
Permanent Dentition			
Maxilla	11.4	11.5	10.4
Mandible	8.9	15.6	14.8
Both Jaws	10.0	14.1	12.7
Incisors	3.5	12.2	10.6
Canines	6.5	11.5	12.3
Premolars	10.5	17.3	12.7
Molars	13.8	12.7	14.3

There is a similar incidence of alveolar abscessing among the deciduous and permanent dentitions from the three sites (see Table 4). The overall incidence among the permanent dentitions ranges from a low of 10.0 percent in LeVesconte Mound to a high of 14.1 percent for Bennett. When the jaws are considered separately, the two Iroquoian groups have a higher incidence in the mandible, while the opposite is true for LeVesconte Mound. Overall the pattern of abscessing is fairly similar. In general all samples display a posterior increase in abscessing. LeVesconte Mound deviates significantly from the other groups in the incidence among incisors ($\chi^2 6.06$ with $p = .05$). No other comparison reveals any significant differences. One distinctive temporal trend among these samples is a dramatic increase in the incidence of abscessing among the anterior dentition. Perhaps the high incidence of abscessing seen among the anterior teeth of the Iroquoian groups reflects the intensity of caries which led to pulp exposure and ultimately pulpitis. Alveolar abscessing of the deciduous dentitions was found only in the Kleinburg sample.

The deciduous and permanent dentitions of the three samples display varying amounts of periodontal disease. Overall, the incidence of periodontal disease among the deciduous dentitions ranges from a low of 10.9 percent for

TABLE 5
Incidence (%) of antemortem tooth trauma among deciduous and permanent dentitions from selected southern Ontario samples

	LeVesconte Mound	Bennett Site	Kleinburg Ossuary	Glen Williams	Milton Ossuary	Maurice Ossuary	Christian Island
CHIPPED TEETH:							
Deciduous Dentition							
Incisors	13.9	4.0	12.5	0	—	—	0
Canines	9.7	7.7	15.8	1.0	—	—	0
Molars	18.6	0	6.9	5.6	—	—	3.1
Totals	16.1	2.9	7.5	4.1	—	—	1.5
Permanent Dentition							
Incisors	26.3	2.4	29.6	5.9	14.2	*	3.6
Canines	36.5	9.5	26.1	10.3	7.5	*	5.3
Premolars	44.0	14.6	16.3	8.9	8.7	*	2.9
Molars	44.6	4.4	15.0	13.9	3.5	*	6.1
Totals	42.9	7.4	17.1	10.4	8.6	2.8	4.5
FRACTURED TEETH:							
Deciduous Dentition							
Totals	1.7	0	0	0	—	—	0
Permanent Dentition							
Incisors	12.9	0	0	0	0	0	0
Canines	20.8	0	0	0	0	0	0
Premolars	23.0	0	0	0	0	0	0
Molars	25.0	0	0	0	0	0	0
Totals	21.6	0	0	0	0	0	0

* The incidences for the individual tooth types are not presented for Maurice Ossuary because of problems with the computation of the incidences as given by Jerkic (1975). See Patterson (1984) for details.

Kleinburg to a high of about 40 percent for Bennett. The latter is significantly different from the other sites (overall, $\chi^2 47.68$ with $p = .000$).

Generalized periodontal disease is common among the permanent dentitions, ranging from about 64 percent for LeVesconte Mound to almost 83 percent for Bennett. There is a similar incidence among both jaws for each sample. However, the involvement is higher among the maxillae for LeVesconte Mound and Bennett, while the opposite is found for Kleinburg.

Regarding the incidences of antemortem chipping and fracturing among these samples (see Table 5), LeVesconte Mound shows substantial antemortem trauma among the permanent teeth (overall, 45.6 percent), while Kleinburg and Bennett reveal a low to moderate incidence (17.1 percent and 7.4 percent, respectively). There is a similar trend among the deciduous teeth, with a moderate incidence for LeVesconte Mound (16.7 percent) and a low incidence for the other two samples.

Antemortem tooth fracturing is only seen among the LeVesconte Mound teeth, with 1.7 percent of deciduous teeth and 21.5 percent of permanent teeth affected. Among the deciduous teeth, only molars are involved. On the other hand, fracturing is observed in all permanent tooth types, with the canines to molars showing incidences ranging from 19.8 percent to 25.0 percent.

An examination of the patterning of antemortem chipping among these samples reveals a number of differences between LeVesconte Mound and the two horticultural groups. There is a tendency for an increased incidence posteriorly for Levesconte Mound, while the opposite is the case for Kleinburg.

There is a moderate to high incidence of enamel hypoplasia among the permanent teeth of each sample, suggesting that all samples were subjected to periods of nutritional stress. Canines show the greatest incidence of defects (ranging from 50.9 percent for Kleinburg to 76.2 percent for Bennett). The Iroquoian samples display the following pattern, in decreasing magnitude: canines, incisors, premolar, and molar.

The height of the highest hypoplastic line on the tooth crown was measured for all affected teeth to determine the age at which the metabolic disturbances had taken place (see Patterson, 1984 for details). The hypoplastic defects occurred at approximately the same age in each sample: LeVesconte Mound, 3.0 years; Bennett and Kleinburg, 3.2 years. Clarke (1978) notes that the occurrence of such defects from ages two to four suggests post-weaning metabolic disturbances during which children had to adapt to a nutritionally inadequate dietary base. The mortality profiles of selected southern Ontario skeletal samples mirror these findings with an increased mortality rate for the zero to five year age interval (Pfeiffer, 1974; Melbye, 1977; Jackes, 1979; Katzenburg and White, 1979; Patterson, 1984) . It appears that the years immediately following weaning are years during which the Iroquoian child was subject to stress and thus to an increased probability of mortality.

A summary figure of diachronic trends in selected variables of the deciduous dentition are illustrated in Figure 1.

Diachronic trends are not as noticeable in the deciduous dentition as they are in the permanent teeth. The most notable trends are an increase in caries and a decrease in antemortem tooth trauma. There is a slight decrease in occlusal attrition. Although differences are not significant for either antemortem tooth loss or alveolar abscesses, the fact that they occurred among the Kleinburg deciduous dentitions indicates poor oral health, since both conditions are rare among young children.

Figure 2 illustrates the diachronic trends of these same dental conditions for the permanent dentition. The patterns of dental characteristics which "best" seriate prehistoric Ontario populations include antemortem tooth loss, occlusal attrition, caries, and antemortem tooth trauma. The most notable temporal changes are a decrease in occlusal attrition and antemortem tooth trauma, and an increase in antemortem tooth loss and caries. Additionally, the increase in periodontal disease and decrease in enamel hypoplasia are suggestive of possible trends.

DISCUSSION

These analyses quantify the findings of previous investigators and demonstrate that selected patterns of dental disease and attritional status can be utilized to seriate southern Ontario skeletal populations within the developmental sequence. Furthermore, besides merely differentiating between populations who followed a hunting and gathering lifestyle and those who practiced a horticultural economy, one can assign samples to various periods of Ontario prehistory based upon the nature and extent of dental conditions.

LeVesconte Mound differs significantly from the two Iroquoian samples in its antemortem tooth loss, attrition. caries, and antemortem tooth trauma. while many other dental conditions are similar, including alveolar abscessing and periodontal disease. Bennett and Kleinburg show similarities for most dental characteristics. The only major differences are the incidences of enamel hypoplasia and antemortem tooth chipping.

One of the most striking points of this investigation is the marked difference in patterns of tooth trauma between LeVesconte Mound and the two horticultural groups. The substantial antemortem tooth trauma observed for LeVesconte Mound and the lack of antemortem fracturing in the horticultural groups, and the differences in the patterning of antemortem chipping among these groups indicates that hunting and gathering peoples can be differentiated from horticultural groups on these criteria. The incidences of antemortem tooth chipping and fracturing observed among seven southern Ontario samples can be compared in Table 5. LeVesconte Mound shows substantial antemortem tooth trauma, while the other samples display low to moderate involvement. This pattern of antemortem chipping suggests that hunting and gathering peoples made extensive use of their posterior teeth for processing of their food. while horticultural groups made use of their anterior teeth for such purposes.

Caries incidence is strongly associated with the amount and type of carbohydrate eaten. As such, the intensity and pattern of caries prevalence among dentitions reveals much about the subsistence base of a population (Klatsky and Katell, 1943; Wells, 1975; Turner, 1978, 1979). The results of the analysis of caries amongst these three samples discussed here indicate that the two Iroquoian samples represent people with a substantially horticultural subsistence. The high level of maize included in their diets is indicated in part by the moderate incidence of carious lesions among the deciduous teeth, especially the molars, and rampant caries in the permanent dentitions. LeVesconte Mound is markedly different from the two horticulturally based samples. There is a very low incidence among the deciduous teeth (about one percent), while among the permanent dentition there is a very low carious involvement of anterior teeth and premolars. Molars are the only teeth to display a moderate level of caries (approximately 13 percent). Therefore, it appears that LeVesconte Mound people were primarily dependent upon a hunting and gathering subsistence base. However, the fact that there is a moderate incidence of caries and that the carious lesions are evenly distributed among the tooth surfaces raises the possibility that these people were also incipient horticulturalists.

Several previous investigators have suggested that there is a diachronic trend in the incidence of caries among prehistoric Ontario samples (Knowles, 1939; Anderson. 1968; Cybulski, 1968, 1982; Molto, 1985, 1979; Patterson, 1979, 1984). Comparison of the incidences of carious lesions among fifteen southern Ontario skeletal samples confirms that there was a substantial increase in caries over time (see Table 6). Additionally, differences among Pre-Iroquois and Iroquois groups suggest that substantial changes occurred in the subsistence base from Middle Woodland to early Late Woodland times. It is known that by the Early Ontario Iroquois stage maize horticulture had become a staple in the Ontario Iroquois subsistence base (Wright, 1966; Noble, 1975b; Tuck, 1978). Maize has been recovered from the early Glen Myer Porteous site, as well as from several Princess Point sites dating between A.D. 400 to A.D. 500. Therefore, it is probable that some cultigens had been introduced into southern Ontario sometime during the era of A.D. 300 to A.D. 500. The horticultural pursuits did not become a major component of the subsistence base until about A.D. 800 by which time a shift had occurred from seasonal riverine mudflat habitation to semi-permanent villages situated in well drained sandy upland regions bordering the major river valleys (Stothers, 1977).

This study, and its expansions to include other comparative samples indicates that maize was adopted fairly rapidly. In the time period before 0 A.D., there was a very low incidence of caries which reflected low amounts of carbohydrates affecting teeth whose contact points had broken down causing food impaction and subsequent dental decay. By about A.D. 100 there had been an increase in the intensity of carious lesions which corresponded to the introduction of cultigens into Ontario. The moderate incidence of caries among molars and low involvement of anterior teeth suggests that cultigens were regularly being selected and included as a minor component in the diet. For the next 600 to 800 years, the incidence of caries

TABLE 6
Incidence (%) of dental caries among deciduous and permanent dentitions from comparative southern Ontario samples arranged in chronological order.

Sample	Dating	Deciduous Dentition No.	Deciduous Dentition Incidence	Permanent Dentition No.	Permanent Dentition Incidence
Donaldson I (Anderson 1963)	550 BC ± 80 years	—	—	93	0
Serpent Mounds (Anderson 1968)	Late Point Penninsula	—	—	885	2.6
Donaldson II (Molto 1979)	AD 5 ± 75 years	18	0	155	7.7
Plum Point (Cybulski 1982)	circa AD 200	—	—	34	5.9
LeVesconte Mound	AD 230 ± 55 years	175	1.1	337	6.5
Surma Mound (Cybulski 1968)	circa AD 700	—	—	269	7.4
Serpent Pits (Anderson 1968)	circa AD 1000-1200	—	—	316	10.8
Miller Ossuary (Ossenberg 1969)	circa AD 1115	—	—	163	26.4
Bennett Site	circa AD 1260-1280	66	13.6	149	30.2
Glen Williams (Hartney 1978)	circa AD 1400-1450	719	13.9	2745	22.4
Roebuck Site (Knowles 1939)	circa AD 1500	313	17.2	963	25.0
Kleinburg Ossuary	AD 1600 ± 20 years	415	29.2	2842	40.6
Shaver Hill Ossuary (Wright n.d.)	circa AD 1610	—	—	672	28.1
Maurice Ossuary (Jerkic 1975)	circa AD 1640	—	—	1258	27.6
Christian Island (Hartney 1978)	AD 1649-1650	364	17.3	1096	23.3

remained stable, although by the beginning of the Early Ontario Iroquois stage the incidence had begun to rise somewhat. During this transitional period the diet included abrasives from gathered food plants, but also included a sufficient amount of cultigens to facilitate the development of pit and fissure caries among the posterior teeth. A major increase in the incidence of caries occurred by late Early Ontario Iroquois times which corresponded to the adoption of maize as the major dietary staple (Wright. 1966: Noble. 1975b; Trigger, 1976). This trend continued up until proto-historic times when caries had become very common throughout the dentition.

In conclusion, this study demonstrates the importance of investigating the oral health of prehistoric populations. It shows that the changes in dental health related to changes in particular subsistence patterns and dietary adaptations which have been demonstrated for other geographic regions can be applied to samples from Southern Ontario. These can be used to seriate skeletal samples within an archaeological developmental sequence. Furthermore, changes in subsistence patterns implied by archaeological data, such as "heavy dependence upon maize horticulture" can be quantified.

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NOTES

1. Ed. Comment: This number is at variance with other estimates of the Kleinburg sample size (see Jackes and Pfieffer, this volume). Information here and in Patterson (1984) is insufficient to explain the disparity, but it serves to illustrate the difficulties inherent in ossuary assessment. All comparative oral statistics presented here are proportional and tooth site dependent, and so are not directly linked to total sample size. Comment by Pfieffer.

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PALEONUTRITION IN SOUTHERN ONTARIO EVIDENCE FROM STRONTIUM AND STABLE ISOTOPES[1]

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Abstract: Studies of human palaeonutrition have recently been approached through chemical analysis of prehistoric human skeletal remains. Strontium content of bone mineral has been reported as a means of determining the relative proportions of animal and plant protein in the diet. Ratios of stable isotopes of carbon have been used to determine the timing of the introduction of C_4 plants, such as maize, into the diet. Stable isotopes of nitrogen have been used to determine the importance of marine and terrestrial foods in the diet. In this paper, evidence from all three approaches is applied to a dietary reconstruction of the aboriginal population of southern Ontario.

Two previously reported studies are reviewed. Katzenberg (in press) determined the strontium content of bone mineral in five populations. Schwarcz, Melbye, Katzenberg, and Knyf (1983 and in preparation) determined carbon and nitrogen isotope ratios in bone collagen in the same populations plus seven additional ones, thus greatly expanding the time period covered.

Strontium results indicate relatively little change over time in protein source. It was suggested that increasing reliance on low strontium maize at the expense of a varied diet of gathered foods resulted in lower strontium values in more recent populations. Carbon isotope results confirm the timing of the introduction of maize evidenced in the archaeological record and also support the idea that once adopted, maize became an important component of the diet. Results of nitrogen analysis suggest decreasing variability in the diet in concert with the strontium results.

We conclude that the use of multiple sources of information enhances attempts at palaeodiet reconstruction. Further we discuss the implications of the proposed dietary changes for the health and population structure of Ontario populations.

Résumé: Récemment on a abordé des études de la paléonutrition humaine à travers l'analyse chimique des restes squelettiques des humains préhistoriques. On a examiné la teneur de strontium dans les minéraux des os pour déterminer les proportions relatives de la protéine animale et végétale dans le régime. On a utilisé les proportions des isotopes stables de charbon pour établir la durée nécessaire pour introduire dans le régime des plantes C_4, comme le mais. On a employé les isotopes stables de l'azote pour déterminer l'importance des aliments marins et terrestres dans le régime. Dans ce papier on a appliqué l'évidence de toutes les trois méthodes à la reconstruction alimentaire de la population aborigène dans l'Ontario du Sud.

On a examiné deux études autérieures. Katzenberg (déjà sous presse) a constaté la teneur de strontium dans les minéraux des os dans cinq populations. Schwarcz, Melbye, Katzenberg, et Knyf (1983 et sous presse) ont déterminé les proportions des isotopes de charbon et d'azote dans le collagène des os dans les mêmes populations et dans sept populations de plus; ainsi, la période de temps qu'on examinée s'est bien grandie.

Quand on a examiné les résultats de strontium, on n'a remarqué qu'un petit changement à travers le temps, en ce qui concerne la source de la protéine. On a suggéré que, s'il y a une confiance ascendante sur le mais qui n'a pas beaucoup de strontium au lieu d'un régime varié de nourritures recueillies, on remarquerait de plus petites valeurs de strontium dans les populations plus recentes. Les résultats des isotopes de charbon confirment que la période pour l'introduction du mais démontrée dans les registres archaéologiques est correcte et, en plus, ces résultats soutiennent la théorie que, une fois adoptée, le mais est devenu un composant important du régime. Les résultats de l'analyse d'azote suggèrent une variabilité descendante dans la régime en accord avec les résultats de strontium.

Nous abouton à la conclusion que l'emploi de sources des informations multiples aide aux efforts de reconstruire le paléorégime. En plus, nous discutons les implications des changements alimentaires proposés pour la santé et la structure démographique des populations dans l'Ontario.

Key Words: **Palaeonutrition, maize introduction, strontium isotopes, Southern Ontario.**

INTRODUCTION

Southern Ontario provides an ideal situation for studying dietary change during the prehistoric and early historic periods. There is a wealth of material which has been studied from a number of complementary perspectives, thus providing the necessary backdrop for studies of paleonutrition. The techniques to be discussed, analysis of strontium and other elements of bone mineral, and analysis of stable isotopes of carbon and nitrogen in bone collagen, are welcome additions to the study of the interaction of diet and health. Until recently, the approach toward investigating the effects of dietary change on human health consisted of: a) finding evidence of a shift in subsistence (e.g. through the analysis of food refuse, and tools used to procure and prepare food), b) examining the skeletal and dental remains of populations spanning the subsistence shift for evidence of stress related pathology (e.g. infection, anemia), change in adult stature, incidence of dental caries, formation of Harris lines or any of a number of other indicators of dietary stress, c) demonstrating a correlation between "a" and "b", and suggesting possible causes for the correlation based on available evidence.

This approach is sound and has provided a wealth of data on North American populations (Buikstra and Cook, 1980; Cohen and Armelagos,1984; Martin, *et al.*,1985; Rose *et al.*, 1985). Resulting data reveal consistent patterns for certain disorders which vary in incidence in horticultural versus hunting and gathering groups. Still, there are additional variables such as population size and density which cannot be controlled. In addition, the timing of the introduction of cultigens, as evidenced in the archaeological record, may not correspond closely with the significant incorporation of the cultigen into the diet. Therefore it is desirable to determine diet directly from human remains. The derived information, in conjunction with the previously outlined approach, goes further toward allowing a clear understanding of the relationship between diet and disease. Two techniques for determining diet directly from bone are discussed. The focus of the paper is on the information obtained from the application of these techniques to Ontario populations.

BONE MINERAL STUDIES

The mineral portion of bone is composed predominantly of calcium and phosphorus which occur in noncrystalline and crystalline forms (Posner, 1969). Bone mineral occurs as hydroxyapatite [$Ca_5(PO_4)_3OH$]. Substitutions of chemically similar elements which commonly occur include fluorine for hydroxyl (OH), and lead or strontium for calcium (Ca). The first substitution allows relative dating of interred bone since, once in place, fluorine from the soil and ground water is more firmly bound than hydroxyl, so fluorine accumulates over time. The calcium position is more stable so that substitution of strontium for calcium during the lifetime of an individual does not appear to be altered during interment (Parker and Toots, 1980; Lambert, *et al.*, 1983).

The principles of using strontium as a dietary indicator have been detailed elsewhere (Toots and Voorhies, 1965; Brown, 1973; Schoeninger, 1979; Sillen, 1982; Katzenberg, 1984) so they will be presented only briefly here. Strontium is ubiquitous in the environment. Its occurence in rocks and soils varies depending on a number of factors, all of which interact in a strontium cycle (Hamilton, 1979). The amount of strontium available to plants is dependent on soil content. Herbivores ingesting plants discriminate against strontium in favor of calcium. Strontium which is not excreted is deposited in the skeleton, where it substitutes for calcium (Schroeder, *et al.*, 1972). Due to this discrimination and skeletal deposition, carnivores ingest relatively little strontium. Again, there is discrimination in favor of calcium, and deposition of remaining strontium in bone. As a result, carnivores and herbivores living in the same area should exhibit different levels of strontium in their bones, the former having less than the latter. Theoretically, humans consuming a diet high in plant protein should have more strontium in their bones than humans subsisting largely on meat. Several finer points should be mentioned. Among plants, legumes and leafy plants contain more strontium than grasses (Menzel and Heald, 1959). Nuts are particularly high in strontium. Marine fish and molluscs contain higher levels of strontium than freshwater species, although shellfish from both habitats tend to concentrate strontium and thus contain more than plants (Rosenthal *et al.*, 1970). Based on these points, it has been suggested that bone strontium levels can be used to differentiate human consumers of strontium-rich foods, such as nuts, molluscs and leafy plants, from consumers of low strontium grasses, specifically maize (Katzenberg, 1984).

In addition to strontium, other elements present in bone mineral have proven useful in dietary reconstruction, primarily for their use in interpreting and adjusting data on strontium. Calcium and phosphorus are useful for determining the magnitude of diagenetic change in bone (Sillen, 1981; Katzenberg, 1984). Other elements, including zirconium, aluminum, manganese and iron are indicative of the soil environment in which the bones were interred (Szpunar *et al.*, 197 8; Katzenberg, 1984).

In southern Ontario the introduction of tropical cultigens is first in evidence around A.D. 700 with the earliest appearance of maize (Stothers, 1977). Beans followed [circa A.D. 1100 (McAndrews *et al.*, 1982)], and squash remains are evident after A.D. 100 (Cooper, 1982). Prior to A.D. 700 subsistence was based on indigenous plants and animals. By the time of European contact (A.D. 1615) subsistence was largely based on maize. Both the comparison of pre-maize and maize subsistence and the shift from adoption through to heavy dependence on maize are of interest. Because there are numerous prehistoric sites in southern Ontario representing a long temporal span, and because considerable data are available on plant and animal remains, the area is an excellent one in which strontium analysis may be applied. An additional advantage of examining paleodiet in southern Ontario is the availability of ethnohistoric records which include detailed descriptions of the diet in early historic times.

Results of strontium analysis indicate whether the proportion of animal protein to plant protein varied throughout prehistory, and particularly if any variation occured over the transition from hunting and gathering to horticulture. The second technique for determining diet directly from human remains provides more specific information than strontium analysis. Rather than revealing shifts in the protein source, analysis of stable isotopes of carbon and nitrogen reveals the utilization of specific plants.

BONE COLLAGEN STUDIES

If one dissolves the mineral portion of bone, the 30% remaining consists largely of the structural protein, collagen. The carbon present in collagen (and in all protein in the body) is made up of two stable isotopes, ^{13}C and ^{12}C. These two isotopes occur in varying proportions in plants and the differences are retained through metabolism of the plants by human consumers. Therefore the ratio of $^{13}C/^{12}C$ in human bone collagen reflects diet. The principles of using carbon isotopes to determine paleodiet have been described elsewhere (van der Merwe and Vogel, 1978; DeNiro and Epstein, 1978; van der Merwe, 1982; Schwarcz *et al.*, 1985) so they are presented only briefly here.

Most plants growing in temperate regions of North America fix carbon so that during one stage of photosynthesis a three-carbon molecule is formed, thus they are referred to as C_3 plants. Many plants which are found in tropical regions, and which are adapted to a greater intensity of sunlight and less water fix carbon by a different pathway in which a four-carbon molecule is formed. Included in this group are maize, millet, sugar cane and some species of *Chenopodium*. C_4 plants are enriched in the heavier stable isotope of carbon in comparison to C_3 plants, thus the ratio of $^{13}C/^{12}C$ is higher in C_4 plants. This ratio is expressed as $d^{13}C$‰, the difference in the ratio of a sample as compared to that of a standard. There is a shift in the ratio of approximately +5 from food source to collagen (van der Merwe and Vogel, 1978). Thus human bone collagen from consumers of maize will have higher $d^{13}C$ than collagen from populations dating prior to the introduction of maize. This was demonstrated for the northeastern United States by van der Merwe and Vogel in 1978. Schwarcz and colleagues (1985) conducted a similar study for southern Ontario populations. The presence of maize can be determined by analysis of plant remains, and its increasing importance is assumed as the number of kernels and cobs recovered from sites increases. The use of carbon isotope analysis adds another perspective. By determining the ratio of $^{13}C/^{12}C$ in bone collagen of populations from differing periods, the actual contribution of maize to the diet can be determined. Another application of carbon isotope data is the differentiation of marine versus terrestrial sources of food (Chisholm *et al.*, 1982). Consumers of marine organisms have $d^{13}C$ values similar to those of consumers of C_4 plants. Since there is no evidence for the utilization of marine foods by aboriginal populations in southern Ontario $d^{13}C$ values reflect plant foods only.

Another element present in collagen and useful for reconstructing paleodiet is nitrogen. Nitrogen isotopes, ^{15}N and ^{14}N, vary in plants and are particularly characteristic in legumes, which have a lower ratio of $^{15}N/^{14}N$ (lower $d^{15}N$‰.) than do other plants. This is due to the ability of legumes to fix nitrogen in the soil, resulting in depletion in the plant. Plants in general have a higher $d^{15}N$ value than do terrestrial herbivores (DeNiro and Epstein, 1981). Freshwater fish have higher $d^{15}N$ values than both plants and terrestrial herbivores (Schoeninger *et al.*, 1983). As a result of these observations, one would expect lowered $d^{15}N$ values with the adoption of beans into the diet. The mineral composition of prehistoric Ontario bone was the subject of a study by Katzenberg (1984). Determination of the isotopic composition of prehistoric Ontario bone was the subject of a study conducted by Schwarcz, Melbye, Katzenberg and Knyf, (1983 and 1985). The results of these studies are presented in order to show how they complement and enhance each other in reconstructing paleodiet through time. The reconstruction is then discussed in light of other sources of information on adaptation in southern Ontario.

SKELETAL POPULATIONS

Five populations from four prehistoric and early historic sites were chosen for the study of trace and major element composition. They range in time from A.D. 120 to A.D. 1636 (table 1). All sites are from a geologically similar area of Ontario (figure 1). (For a discussion of the possible effects of diagenesis the reader is referred to Katzenberg 1984). The earliest population, from the two-component Serpent Mounds site, is pre-horticultural (Johnston, 1968). Human remains from the mound are discrete, fairly complete burials (Anderson, 1968). The second component of the site is represented by three burial pits which may be considered as small ossuaries, or secondary repositories. Each pit contained the co-mingled remains of fifteen to thirty individuals (Anderson, 1968). The three remaining sites, Fairty, dated A.D. 1350 (Kapches, 1981), Kleinburg, dated A.D. 1600 (Melbye, personal communication) and Ossossané, dated A.D. 1636 (Kidd, 1953), are large ossuaries associated with large palisaded Huron villages (Wright, 1966). Twenty ribs were obtained from each population for analysis.

Figure 1.

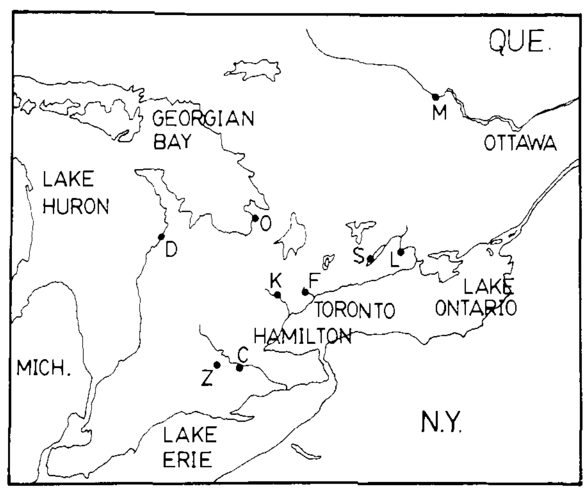

TABLE 1
Sites used in both trace element (TE) and isotope (I) studies

Site	Approximate date*	Study	Cultural Affiliation
Morrison's Island	2300 ±400 B.C.	I	Laurentian Archaic
Donaldson Site	530 B.C.	I	Middle Woodland
	A.D. 5 ±75	I	Middle Woodland
Lavesconte Mound	A.D. 175 ±55	I	Middle Woodland
Serpent Mounds	A.D. 205 ±90 – A.D. 400 ±100	I, TE	Middle Woodland
Serpent Pits	A.D. 1170 ±120	I,TE	Early Ontario Iroquois
Force Site	A.D. 1240	I	Early Ontario Iroquois
Fairty Ossuary	A.D. 1350 ±50	I, TE	Middle Ontario Iroquois
Ball Site	A.D. 1600	I	Late Ontario Iroquois
Kleinburg Ossuary	A.D. 1600	I, TE	Late Ontario Iroquois
Ossossane Ossuary	A.D. 1636	I, TE	Historic (Huron)
Cooper Ossuary	A.D. 1645	I	Historic (Neutral)

* Adapted from Schwarcz, Melbye, Katzenberg and Knyf, in preparation.

Eleven populations from nine sites, including those analysed in the bone mineral study, were analysed for stable isotopes of carbon and nitrogen. They range in time from 2300 B.C. to A.D. 1645 (table 1). The earliest site represents the Archaic period; Donaldson through Serpent Mounds represent pre-horticultural Middle Woodland occupations; and the remainder represent Ontario Iroquois horticulturalists.

METHODS OF ANALYSIS

All bone mineral analyses were performed by crystal dispersive x-ray fluorescence spectrometry in the geology department of the University of Toronto by M.P. Gorton and A. Katzenberg. Precision is about ±0.2% and accuracy was determined by using several standards with mineral composition similar to that of bone.

All isotope analyses were done by mass spectrometry in the geology department of McMaster University by H.P. Schwarcz and M. Knyf. Collagen was extracted using Longin's method (1971) as modified by Chisholm and colleagues (1983). Precision for carbon is about ± 0.1%. and for nitrogen, about ± 0.2%.

RESULTS OF ELEMENT AND ISOTOPE STUDIES

Results of strontium analysis indicate slight but significant changes in bone strontium values over time (figure 2). From the pre-horticultural Serpent Mounds population to the early horticultural Serpent Pits population bone strontium increases. Thereafter, levels decrease. It appears that with the introduction and adoption of maize, a low strontium grass, subsistence shifted. Following Cleland's model of focal and diffuse economies (1976), a formerly diffuse economy, with reliance on a wide range of indigenous foods including such high strontium foods as nuts and molluscs, shifted to a more focal economy, with maize as the staple crop. From a cultural perspective this makes good sense since those who are responsible for gathering (women, in this society) would be occupied with planting, tending, harvesting and storing maize. As a result there would simply be less time for gathering. This hypothesis has been suggested for other regions, for example, Mesoamerica (Flannery, 1968). It is well supported by ethnohistoric reports (Aller, 1954; Sagard, 1939; Thwaites, 1896-1901). Support also comes from analysis of plant remains from archaeological sites (Crawford, 1982). Ethnohistoric accounts speak of acorns, which are abundant in pre-horticultural sites, as famine food. Archaeological sites with maize remains rarely include nut remains, and molluscs are found more frequently in pre-horticultural sites.

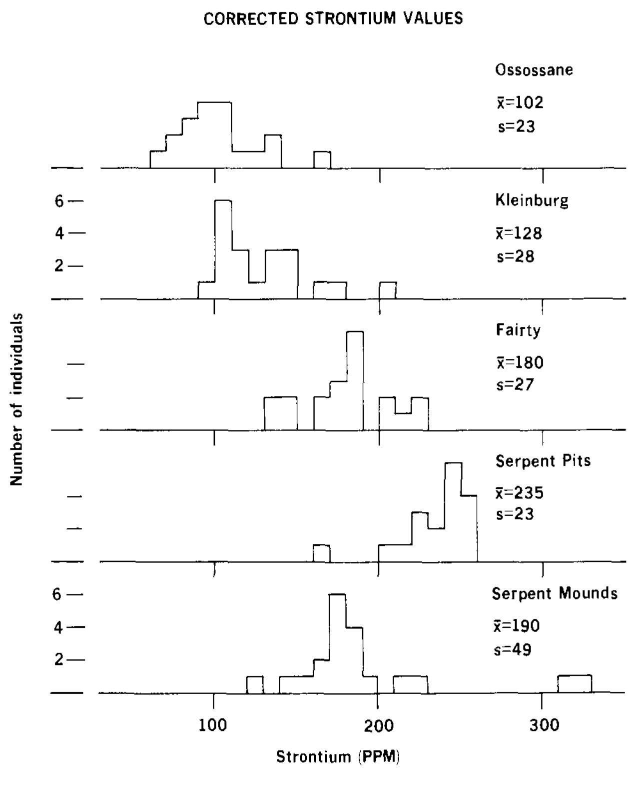

Figure 2.

Results of carbon isotope analyses show a significant increase in d[13]C values between Serpent Mounds and Serpent Pits populations, as expected (figure 3). There is some evidence of C_4 plants (*Chenopodium* or *Amaranthus*). Analysis of *Chenopodium* seeds from prehistoric Ontario sites (Schwarcz *et al.* 1985) demonstrates that at least two of the many species in this genus are C_3 plants. This does not rule out the possibility that native C_4 plants were used, but it would be curious if this were only the case for Donaldson, and not the other pre-horticultural sites. It is interesting that in Molto's description of the skeletal remains from Donaldson II (1979) he notes that the dentition show a pattern of wear and caries similar to that found in early horticultural populations elsewhere in southern Ontario. The carbon isotope ratios from Donaldson remain perplexing. Further, the dates of the two cemeteries at this site are by no means agreed upon. It is hoped that new radiocarbon dates will help in future interpretations of the site.

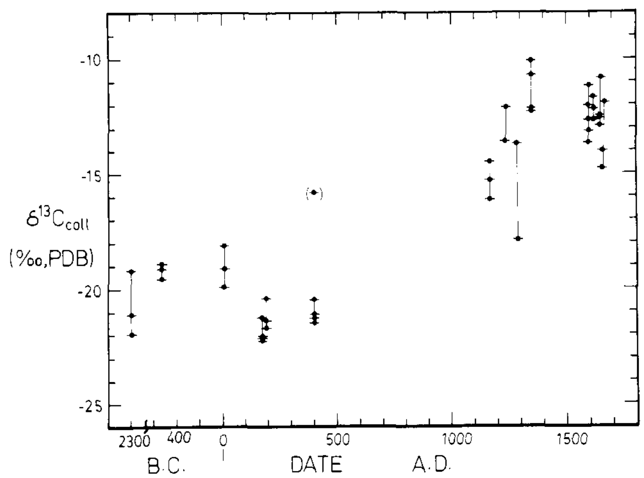

Figure 3.

The increase in d[13]C values over time, beginning after A.D. 500, can be best interpreted as an increase in the consumption of maize. The very high values in the early historic sites probably reflect a high percentage of maize plus consumption of maize-eating herbivores and omnivores such as deer and dogs. Use of both animals as regular items in the diet is evident from both the archaeological record (Latta, 1976) and the ethnohistoric record (Thwaites 1896-1901).

Results of nitrogen analyses show no significant change over time (figure 4). This is somewhat surprising since the addition of beans to the diet was expected to lower nitrogen values. It is unclear from the ethnohistoric reports whether beans were cultivated (Tooker, 1964). If they were, these data suggest beans were not consumed in large quantities. The lack of variation in nitrogen values supports the earlier interpretation of strontium values. If meat had decreased in importance with the introduction of maize, this would have been reflected by increasing strontium values and decreasing nitrogen values over time. Both strontium and nitrogen are fairly stable and the decrease in strontium can be explained by a shift in plant foods. This shift is demonstrated by the carbon results.

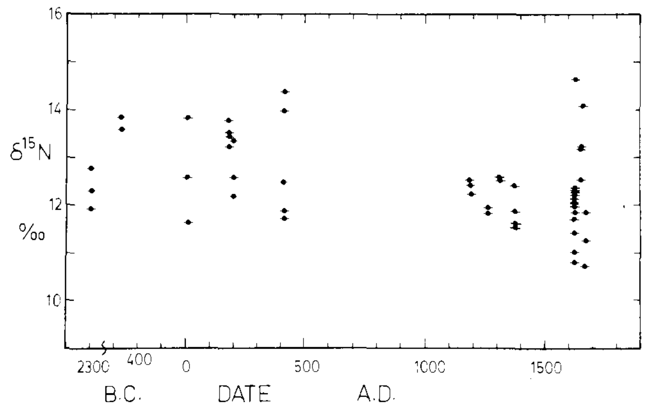

Figure 4.

The picture which emerges from these three lines of evidence may be summarized as follows. Soon after its introduction, maize became an increasingly significant component of the diet. As maize consumption increased, utilization of native plant foods decreased. The proportion of animal protein in the diet appears to have been fairly stable over time. Beans may have been incorporated into the diet, but they were not used in sufficient quantities to depress nitrogen isotope ratios.

If the intake of animal protein remained fairly constant over time, as both the strontium and nitrogen data indicate, then earlier reports suggesting there was insufficient protein to meet nutritional requirements must be re-examined. Numerous researchers have suggested that one consequence of the shift from a diffuse to a focal, maize-based subsistence economy is poor health. Evidence of increased incidence of the conditions mentioned earlier (iron-deficiency anemia, Harris lines, non-specific infection, dental disease, etc.) has been found in the southwestern United States (Kelley, 1980), the Midwestern United States (Cassidy, 1980; Lallo *et al.*, 1978; Rose, 1973; and Mensforth *et al.*, 1978) and in Ontario (Katzenberg, 1981 and Patterson, 1982). Yet the change in health may not be due to the subsistence shift in any or all of these areas. Cleland (1976) points out that as one moves toward the northern edges where the number of frost-free days approaches the number necessary to grow maize, the economy tends to be more similar to a diffuse one, with the cultigen as only one component. In other words, the emphasis on maize may have been much greater in the midwestern United States than in Ontario. If this is the case, as these data suggest, then one must look to other explanations for the declining health observed in recent prehistoric and early historic Ontario populations. One possibility which must be considered is the change in population structure and density which accompanied the shift from hunting and gathering to horticulture. An even more dramatic shift in population distribution occured with the inception of the fur trade and the escalating influence of European contact which culminated in the destruction of Huronia in 1649 (Trigger, 1961). There are many lines of investigation which require further study in order to form a clear picture of the interaction of nutrition, disease and demography in southern Ontario.

NOTES

1 This is an expanded version of a paper presented at the 53rd annual meeting of the American Association of Physical Anthropologists, Philadelphia, 1984.

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MORBIDITY AND MORTALITY IN THE UXBRIDGE OSSUARY

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Abstract: The analysis of skeletal material from the protohistoric Uxbridge Ossuary (Southern Ontario, 1490 ± 80 A.D.) illustrates many of the attractions and obstacles of ossuary analysis. A minimum of 457 individuals were interred 32% of whom were immature. Assuming ossuary burial once each decade, population size is estimated to be approximately 1200. Using dental and pelvic age and sex indicators, demographic characteristics are reconstructed. Characteristics of the life table, such as the life expectancy at birth of 25 years, are consistent with results from other ossuaries such as Ossossané and Fairty. This is perplexing, since at Uxbridge there is strong evidence for a high incidence of tuberculosis. A minimum of 26 skeletons are affected (8 immature, 18 mature). Since tuberculosis rarely includes bone involvement, this indicates that tuberculosis may have affected a very large proportion of the population. Possible interaction among disease, warfare and diet are discussed.

Résumé: On peut voir les attractions aussi bien que les problémes de l'analyse des ossuaires si on étudie les restes squelettiques de l'Ossuaire Uxbridge (dans l'Ontario du Sud 1490 ± 80 A.D.). Un minimum de 457 gens y'étaient enterrés, parmi lesquels 32% n'étaient pas arriveés à la complète maturité. Si on présume que l'enterrement dans un ossuaire se passe une fois tous les dix and, on peut estimer que la population est à peu près 1200. On a reconstruit les traits démographiques en employant les témoins dentaires, sexuels, et l'âge pelvien. Les traits de la table de vie, comme le e_x^0 de 25 and s'accordent avec les résultats des autres ossuaires comme Ossossané et Fairty. Ce fait pose des problèmes parce qu'il y à beaucoup de traces à Uxbridge que la tuberculose est arrivée souvent. Un minimum de 26 squelettes sont affectés (8 qui n'etaient pas mûrs). Puisque la tuberculose n'afflige que rarement les os, ce fait indique que tuberculose a pu affecter une grande proportion de la population. On a discuté de l'action réciproque parmi la maladie, la guerre, et le régime. Comment peut-on concilier "une épidémie" de TB avec un profil démographique qui est "normal"?

Key Words: **Morbidity, Mortality, Uxbridge ossuary, Hurons, Southern Ontario.**

INTRODUCTION

One phenomenon makes the study of skeletal biology in Southern Ontario unique: the presence of ossuaries. It is not the only place in North America where native people practiced secondary interment in a communal pit. Prehistoric ossuaries have been excavated in the mid-Atlantic region of the United States as well (Ubelaker, 1974). However, it is in Southern Ontario, where the mass burial pits are closely associated both spatially and temporally with historic documentation of their use. The ethnographic accounts of the Huron Feast of the Dead should offer us insights into how the ossuaries came to exist and who is in them.

The accounts of several reliable observers. Champlain (Biggar, 1929:160-163), Sagard (Wrong, 1939:211), and Brebeuf (Thwaites, 1896-1901, 10:279-305; Kidd, 1953:372-375) are consistent in their observations of regularly scheduled mass burial accompanied by a major sacred ceremony. These accounts have been summarized and discussed elsewhere (Heidenreich, 1971; Tooker, 1964; Trigger, 1969, 1976). Archaeological excavation of ossuaries has not always confirmed every detail of these ethnographic accounts. For example, observers noted that valued goods were buried in the ossuary pit. It has become clear that artifacts, though common in historic ossuaries, are virtually absent from prehistoric ossuaries (Jamieson, 1981). Evidence for the reported scaffolding around the burial pit has not always been found. The structure of some Southern Ontario ossuaries is quite different from that described ethnographically. The Grimsby site (historic Neutral) included a large portion of carefully arranged, articulated individuals (Kenyon, 1977, 1983). The uxbridge site (see below) appears to have been lined with burned, human bone (Cook, 1977). Furthermore, it is clear from house floor and refuse pit interments that not every eligible individual was included in an ossuary (Knight and Melbye, 1983: Fitzgerald, 1979: Williamson, 1978).

Thus, as more archaeological evidence is reported it becomes more difficult to accept all reported ethnographic details as broadly applicable. However, thusfar there is no reason to discard the generalities that ossuary construction was regularly scheduled and was highly ritualized. The study of most Ontario ossuaries is based on acceptance of certain ethnographic assumptions: the ossuary mode of burial was used by Ontario Iroquoian populations from approximately 1300 A.D. (Wright, 1972) until the tribe's demise after European contact. Every

8-12 years the bodies of those who had died since the last Feast of the Dead were taken from their place of initial interment and reburied with much ceremony in a large common pit. Several villages in a region might co-operate to put on such a feast. These neighbours might or might not bring their relatives' remains for inclusion. The ossuary would hold at least 100, and sometimes over 500, individuals. People who had died a violent death, or committed suicide, and very young infants were not usually included in the pit. The remains of those who are interred were tightly packed and thoroughly mixed (Pfeiffer, 1980) and may have been purposely dismembered (Melbye, pers. com.). Only on the floor of the pit are major articulations likely to survive.

The remains found in an ossuary are thus believed to constitute the members of one breeding population who died during a fixed time period, and the duration of that time period is essentially known. This is the appeal of ossuary research: working with virtually an entire population. The completeness of the sample allows the researcher to ask probability-based questions: "What was the probability of dying before maturity, of suffering from a particular disease, or of breaking a limb?". Working with such large, representative samples, ossuary researchers should have the best opportunity in North America to answer the question, "What was it like to live in this region before European contact?" The major obstacle is, of course, the fact that the individual bodies within the sample cannot be reconstructed.

The analysis of an ossuary can be a methodological challenge since the sample consists of large sub-samples of separate bones (femurs, ribs, metatarsals, etc.) and each element may be broken into several fragments. For one ossuary sample that has been completely cleaned and catalogued (Kleinburg), this meant sorting and labelling over half a million pieces of bone (Melbye, pers. com.). Anderson notes that his report on *The People of Fairty* took five years steady work to reach completion (1964). Because of the magnitude of an ossuary analysis, the literature to date mainly describes single-question projects in which a researcher realistically limits herself to investigating one bone or one group of bones to answer a specific question, like, "What proportion of the adults in this sample suffered from sinusitis?"

The remainder of this paper will describe my analysis of the Uxbridge ossuary sample thus far, in which I have tried to select several key questions and focus on skeletal elements that can offer the best answers. Specifically, the minimum sample size, the mortality and morbidity profiles are described. The analysis is not exhaustive. Many more topics could be fruitfully investigated. In this way, Uxbridge is like all other ossuary samples: they are such potentially rich sources of information that analysis is never complete.

THE UXBRIDGE OSSUARY: MATERIALS AND METHODS

The Uxbridge Ossuary (BbGt-1) was located approximately 100 kilometers northeast of Toronto, Ontario. It was excavated from 1975 to 1977 by P. Cook and members of the Ontario Archaeological Society. It has a radiocarbon date of AD 1490±80 (I-9865). The excavators found virtually no grave goods, a characteristic of prehistoric Iroquoian ossuaries, but with such a late date the site cannot be assigned to a pre- or proto-historic category with complete certainty. The excavators reported a layer of burnt human bone underlying most of the ossuary (Cook, 1977). I examined a large portion of this cremated bone. Of 32 individuals (assuming no mixing among features), six are immature. There is no evidence of one sex being more commonly represented. Hence, neither sex nor age factors were clearly and consistently considered in determining which individuals would be cremated. While it is not known how many individuals were cremated, the bulk of the ossuary material shows no sign of burning. No further analysis of the cremated material has been done.

The non-cremated skeletal material was cleaned and catalogued, and certain key elements were differentiated, including all dental and jaw material, all pathological material, all adult innominates and second left metacarpals. The dental and jaw material is needed to determine the minimum number and the immature age profile. The innominate material is needed to establish age and sex of the adults, and the metacarpals are useful for quantifying cortical bone quality.

Pathological specimens posed a special problem. Any skeletal abnormality is best interpreted in context, that is, within the body from which it came. Each time we noted an abnormality, we searched all material from that bone's provenience to find possible articulations. This approach met with limited success. Ultimately there were 300 catalogued pathological specimens from a sample of 457 people! Pathological material is often especially fragile and broken, and probably several elements from the same individual are in some cases catalogued separately. We did not separate and catalogue mild to moderate arthritis or osteophytosis, simple cervical fusions, mild cribra orbitalia, strangely bent metatarsals, slightly expanded diaphyses, etc.

Estimating Sample Size, Age at Death and Adult Sex Ratio

When the minimum number of individuals present in a sample is estimated, there can be large discrepancies in the counts from one body region to another. Not only are some parts of the skeleton more robust than other parts, some are also more easily identified than others. Because breakage is random, researchers cannot just count parts, but must count identifiable landmarks. When studying the Kleinburg ossuary (for descriptions, see Jackes, Patterson, Katzenberg and Schwarcz, this volume.), we found that counts from dental and mandibular landmarks were generally high, presumably because the landmarks are easily identifiable (see Table 1). Some readers may note that the minimum numbers indicated in Table 1 are higher than those cited in an earlier presentation on Kleinburg (Pfeiffer, 1974). The counts herein are based on computer assisted analysis, while the earlier numbers were hand-tallied and less inclusive. Note also that there is a wide range of subadult estimates. This is at least partly explained by the fact that different bones mature at different rates.

TABLE 1
Mimimum number of individuals, Kleinburg Ossuary

	Bone	Landmark*	N
Adults:			
	Ulna, R	trochlear notch	407
	Radius, R	biceptal spur	358
	Humerus, L	septal aperture	398
	Clavicle, R	deltoideus attachment	342
	Scapula, R	glenoid fossa	389
	Femur, R	trochanteric fossa	308
	Fibula, L	distal articular surface	297
	Tibia, L	cnemic diameter	290
	Patella, R	vastus lateralis notch	278
	Innominate, L	acetabulum foramen	240
	Talus, R	height	403
	Calcaneus, R	middle facet	370
	Mandible	sockets L2 to R2	368-398
	Maxilla	socketes L2 to R2	261-368
	Axis Vertebra		324**
Subadults:			
	Ulna,R	notch ossification	93
	Radius, R	biceptal spur	65
	Humerus, R	septal aperture	81
	Clavicle, L	subclavian ridge	119
	Scapula, L	suprascapular notch	61
	Femur, R	diaphysis length	58
	Innominate, R	epiphysis fusion	78
	Calcaneus, R	bipartite	66
	Talus, R	os trigonum	51
	Mandible	sockets L1 to R1	114-219
	Maxilla	sockets L1 to R1	38-143

* enough material must be present for an observation to be made regarding the trait's presence or absence.

**Jackes 1977

TABLE 2*
Representation of adult skeletal elements in the Uxbridge sample

	Right	Left
Ischial tuberosity	247	223
Ilium	133	124
Pubis	124	117
Complete enough for Phenice sex	106	117
Complete enough for age estimation	95	95
Mandible, genial tubercles (minimum number of adults)	312	

* Taken from Pfeiffer (1983)

Considering all these factors, the mandibular material from Uxbridge was chosen to be counted. To be considered as representing an individual, the most anterior, interior region of the mandible (the genial tubercles) had to be intact. For those infant mandibles where death preceded the fusion of the symphysis menti, only the left side (the more common) was counted. Based on this landmark, at least 312 adults and 145 juveniles are represented. Note (Table 2) that this adult count is much higher than that derived from any pelvic landmark.

All immature mandibular material was assessed for age-at-death, using the modified Schour and Massler dental formation and eruption chronology presented by Ubelaker (1978). While all age estimates were ultimately lumped into five-year categories, estimates were initially made as specifically as possible (i.e., 2 years ± 8 mo., 9 mo. ± 30 mo.). Dental eruption was more useful than formation, because so many tooth buds or unerupted crowns were missing from their crypts.

Dental eruption was used to estimate age up to the emergence of the third molar, arbitrarily set at 18 years. We also used a "young adult" category, meaning that M3's were erupted but unworn. The true age range for these late-adolescents and young-adults is uncertain.

All adult innominate material was assessed for sex and age at death. Three independent sex determinations were made, based on anterior pubis morphology as described by Phenice (1969), on observations of the sciatic notch angle and on observation of the preauricular sulcus. Three categories, male, female and "neutral" or undetermined, were used. When there was disagreement, the Phenice indicators were preferred.

Adult age estimates were based on assessment of the pubic symphyses using the techniques of McKern and Stewart (1957) for males and Gilbert and McKern (1973) for females. Each of these techniques result in age ranges of irregular intervals. To transform these age estimates into five-year categories, it was assumed that the true age might fall on any year in the range with equal probability. For example, if there were 14 individuals in the 22-28 year range, 2 individuals would be assigned to each of the seven years. The resulting distribution of ages-at-death was then applied proportionally to the total adult sample size of 312. This technique was used for ages 20 years and above.

Results of the two age estimation techniques, dental emergence and pubic symphysis remodeling, are combined in the figures and tables shown here. The use of different techniques for subadults and adults necessarily leads to inaccuracies in the transition years. Hence the number of individuals in the 16-19 year age category is especially suspect.

From distribution of ages-at-death, survivorship and mortality profiles (Figures 1 and 2) and a life table (Table 3) were constructed. With no adjustment made for the possible under representation of newborn infants (Brothwell, 1971), life expectancy at birth was calculated to be 25 years. Using Acsádi and Nemeskéri's formula to estimate the size of the population (1970), the population size would have been approximately 1188 individuals. This is based on an a ssumption of ossuary construction every ten years. If infants are actually under represented, life expectancy at birth may be substantially lower than 25 years. Thirty-two percent of the sample is immature. Of that 32%, 35% (52) are under one year of age. Compared to some ossuaries where such infants are almost totally absent, this is a substantial infant sample. So, infants may actually be adequately represented here.

The Uxbridge ossuary sample is compared to two other Southern Ontario Iroquois samples in the survivorship profile (Fig. 1). The Uxbridge demographic profile is most similar to that of the Ossossané Ossuary (Katzenberg and White, 1979), the historic ossuary constructed on May 13, 1636 with Jesuits observing (Kidd, 1953). The figures for age at death at Ossossané are derived from measurement of subadult ilia (Merchant, 1975) and assessment of adult pubic remodeling.

An estimate can be made of the ratio of males to females represented among the 312 adults. The Uxbridge adult sex ratio derived from applying the Phenice technique is 1.5:1.O (right =106, left N=117). We found that on relatively intact innominates, the Phenice indicators are in good agreement with iliac sex indicators (sciatic notch, pre-auricular sulcus). Therefore, the iliac indicators were assessed to expand the sample size (right N=133, left N=124).

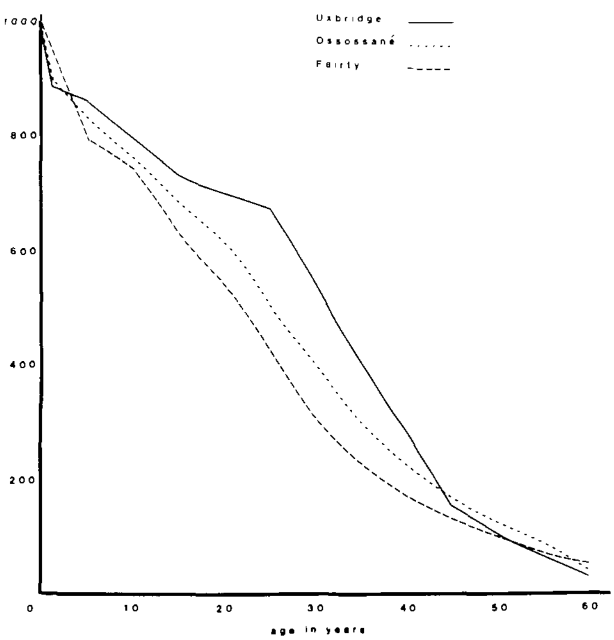


Fig. 1: Survivorship (l^x) curves, expressed as a proportion of survivors. Data from Pfeiffer (1983), Katzenberg and White (1979) and Melbye (1981).

Using iliac sex indicators, the sex ratio is, 0.8:1.0. That is, the notable surplus of males turns into a slight surplus of females. This could be interpreted as reflecting substantial error in the iliac sex indicators, or it could be seen as an indication of differential preservation.

The latter, differential preservation, is a strong possibility. Pubic symphyses are available from only about one third of the adults. The quality of cortical bone is not good in the Uxbridge sample (see below). The bone of the females is likely to be especially thin. Therefore, assuming that both Phenice and iliac sex indicators are valid, the pubic symphyses assessed for age at death are probably not a random sample from the ossuary population. Rather, they are probably biased toward inclusion of males, especially younger males.

Estimating Morbidity and Mortality

If this study of Uxbridge is aimed at ascertaining "what it was like to live back then", information regarding sickness (morbidity) and causes of death (mortality) is crucial. Such information can be gathered from the study of chronic stress indicators such as enamel hypoplasia, growth arrest lines and cortical bone quality, and it can be gathered from the study of paleopathology.

Only one chronic stress indicator has been examined systematically, that being cortical bone quality. All mature second left metacarpals were radiographed, and the measurements of shaft dimensions were compared to those of living populations (Pfeiffer and King, 1983). The assumption behind such a study is that poor health and/or nutritional deficiencies will result in proportionally less cortical bone being maintained. The ninety adult metacarpals from Uxbridge show a mean percent cortical area (Garn, 1970) of 74.5%. This is quite low. Fully 25% of the Uxbridge metacarpals would be classified as osteoporotic. These results probably reflect the presence of chronic dietary insufficiencies, complicated (perhaps) by the presence of infectious diseases.

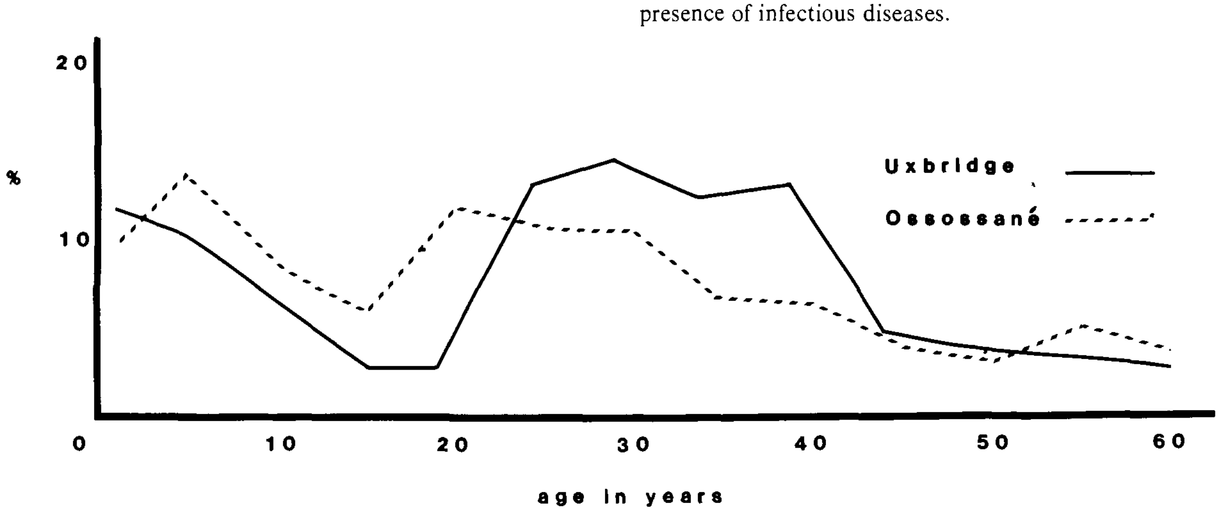


Fig. 2: Mortality (d^x) profiles. Data from Pfeiffer (1983) and Katzenberg and White (1979). (Pfeiffer, 1983, used with permission).

TABLE 3*
Life table, Uxbridge Ossuary

Age	Y_x	d_x	l_x	Q_x	L_x	e_x
0	52	113.8	1000	.1138	943.1	25.0
1	10	21.9	886.2	.0247	875.2	27.1
2-5	31	67.8	864.3	.0784	3321.6	26.8
6-10	28	61.3	796.5	.0770	3829.3	24.9
11-15	13	28.5	735.2	.0388	3604.8	21.8
16-19	13	28.5	706.7	.0403	2769.8	17.6
20-24	59.5	130.2	678.2	.1920	3065.5	14.2
25-29	65.5	143.3	548	.2615	2381.8	12.0
30-34	55.9	122.3	404.7	.3022	1717.7	10.4
35-39	58.7	128.4	282.4	.4547	1091	8.8
40-44	22.2	48.6	154	.3156	648.5	9.1
45-49	17.6	38.5	105.4	.3653	430.8	7.1
50-54	16.6	36.2	66.9	.5411	244	4.8
55-59	14	30.6	30.7	1.0000	76.8	2.5

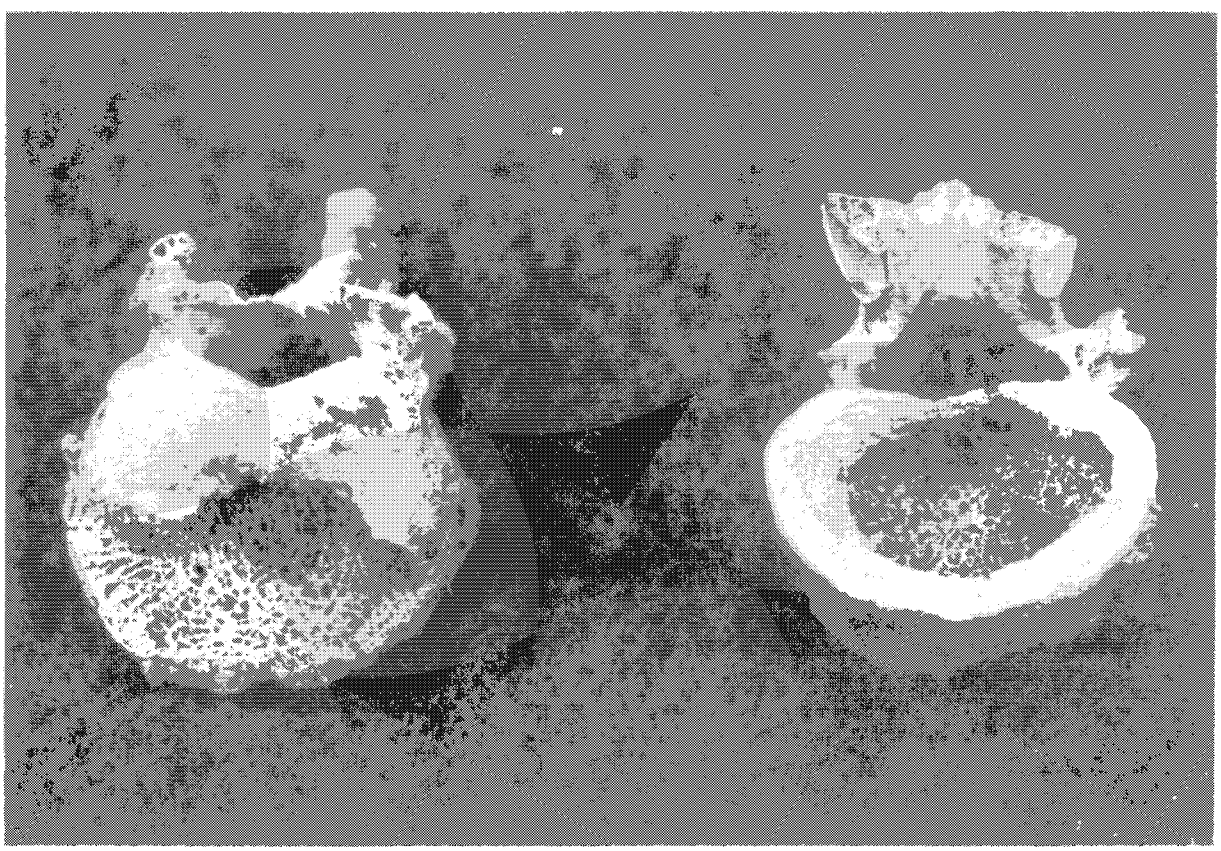
N = 457

* Taken from Pfeiffer (1983)

The diseases affecting the people of Uxbridge can only be studied through their effects on bone. Bone response to disease, when present, is often non-specific. Therefore, palaeopathological evidence is sharply limited. I attempted to classify all "pathological" specimens from Uxbridge into four broad categories: trauma, congenital disability, tumor and infection. These categories are not universally inclusive, but suffice to classify most specimens. This portion of the Uxbridge analysis is treated in more detail elsewhere (Katzenberg, Kelley and Pfeiffer, 1983; Pfeiffer, Katzenberg and Kelley, 1983; Pfeiffer, 1984)

Trauma: Injuries were relatively common. Assuming no more than one fracture per person, 5%-9.4% of the population was affected.

Fig. 3: Lytic lesions are sometimes accompanied by compression (left), and sometimes not (right). (Pfeiffer, 1984, used with permission).



The incidence of fractures has been shown to have declined in North American native populations from Archaic to more recent times (Steinbock, 1976). Indian Knoll (Archaic) shows an incidence of circa 10%, while sites from Mississippian times onward show incidences of under 4%. Another Iroquoian ossuary (Fairty, 1400 A.D.) has a fracture incidence of 3.4% (Anderson, 1964). Uxbridge should show similar incidence, but rather has an incidence of 5% to 9.4%, depending on whether vertebral compression fractures are included in the calculation. Two possible causes for this high frequency of fractures are escalating warfare and weak cortical bone. Some of the wounds are very likely to be associated with warfare, such as the six cranial wounds (none severe) and one pierced vertebra. The projectile point which pierced the spinal column appears to have been the cause of death. As noted earlier, victims of warfare were reportedly not included in Huron ossuaries, yet it is difficult to attribute all such wounds to accidents.

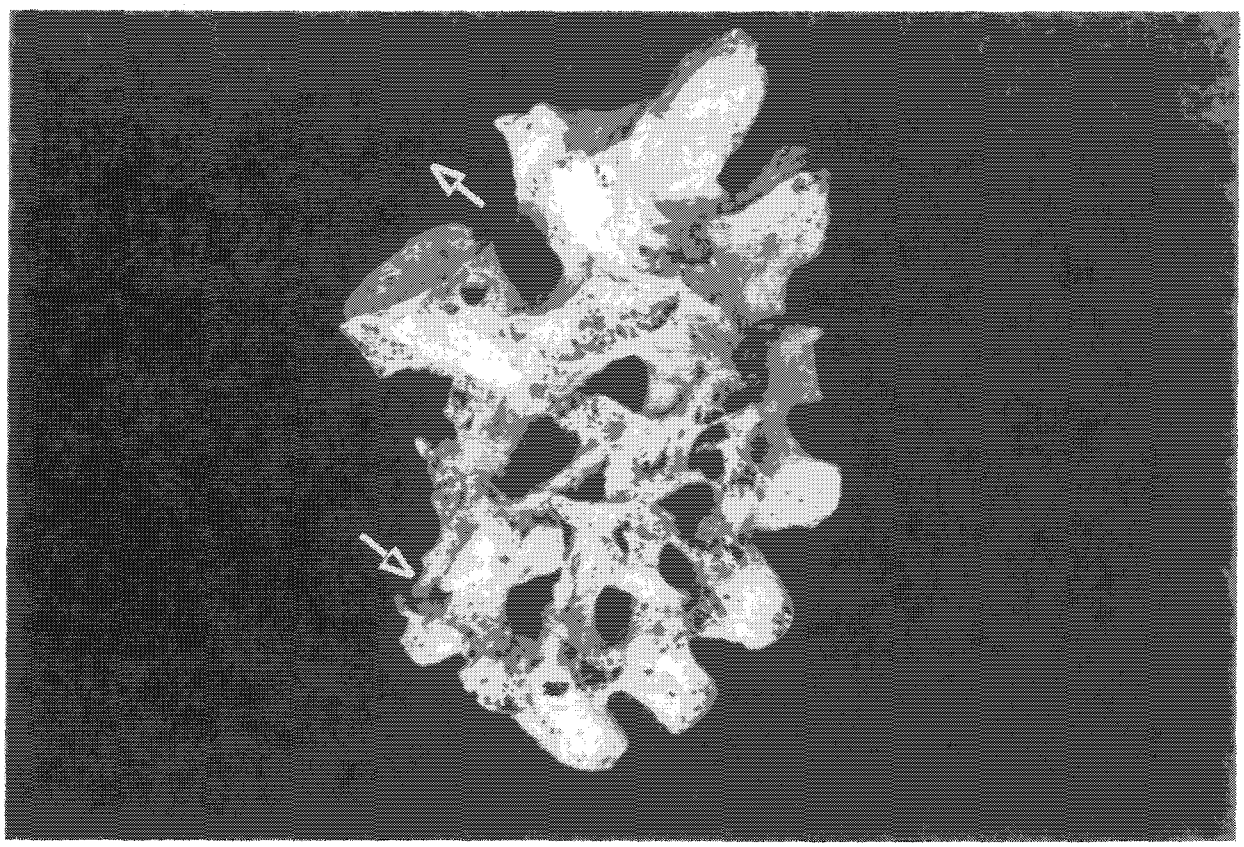
Congenital disabilities and tumors: Compared to trauma and infectious disease, congenital disabilities and tumors are relatively uncommon in the Uxbridge population. Identified conditions include one case of hereditary multiple exostoses (Katzenberg, Kelley and Pfeiffer, 1983), one case of pronounced scoliosis, three cases of premature suture closure (two of them immature), two vertebral columns with hemi or butterfly vertebrae, and four Stafne defects of the mandible. Not all of these may have actually been debilitating. Assuming one such congenital condition per individual, the incidence of congenital disabilities is 2% (11/457).

The aforementioned Stafne defects may be just as appropriately categorized as tumors or tumor-like cysts. Besides these, there is only one other small, probable tumor: a congenital epidermal inclusion cyst on an adult cranium.

Infection: Ossuary material is usually too disarticulated for infectious bone changes to be causally diagnosed. Affected bones, can, however, be classified by type of bone involvement. From the Uxbridge sample, conditions categorized as periostitis, osteitis and osteomyelitis are present in twenty four cases, for an incidence of 5%.

Another category of bone change, degenerative lesions leading to cavitation of cancellous bone, is much more common (see Figures 4, 5 and 6). The appearance, number and distribution throughout the skeleton may offer enough circumstantial evidence than an origin can be proposed. Among affected long bones and patellae, lesions occur only on the articular surfaces, eroding those surfaces and exposing smoothed cancellous bone. Among vertebrae, lesions erode the bodies, chiefly from a superior or inferior origin. In cases where this leads to biomechanical compression, compensatory new bone growth may occur, to the point of ankylosis, with varying degrees of gibbus.

Fig. 4: Seven mature vertebrae, upper- to mid-thoracic, showing severe kyphosis as a result of body erosion and subsequent fusion. White arrows indicate the orientation of the vertebral canal.



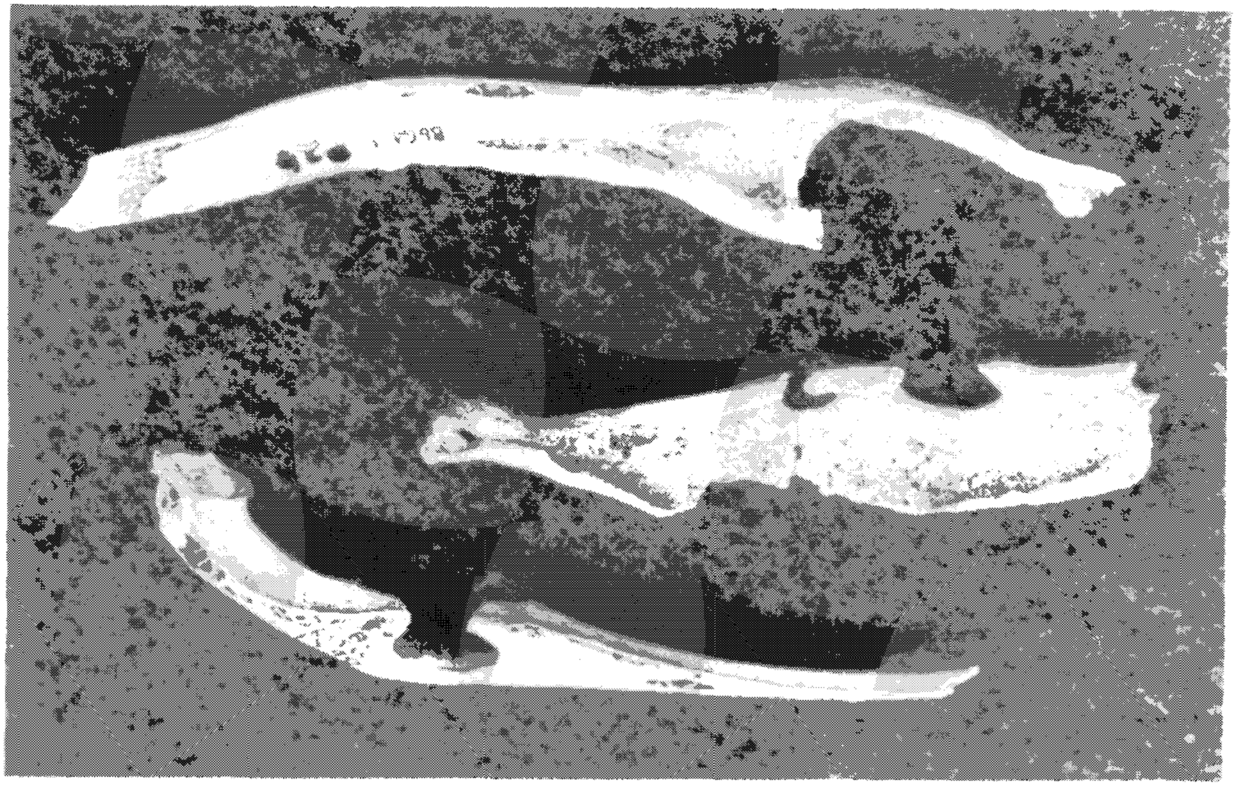


Fig. 5: Fragments of mature ribs showing bone deterioration and remodeling. Kelley and Micozzi (1984) argue that certain rib lesions similar to these are associated with chronic pulmonary tuberculosis.

The lesions most commonly affect lower, thoracic and lumbar vertebral bodies. Their distribution within the skeleton is consistent with a diagnosis of tuberculosis. Such changes may also be caused by various rare diseases such as Paget's disease, typhoid spine, neoplasms, or by fungal infections such as actinomycosis or coccidiomycosis. The changes are too common in this sample to be explained by any rare disease or neoplasm. The only fungal disease likely in a cool, moist area like southern Ontario is blastomycosis, a disease which does affect the skeleton, especially the vertebrae. However, blastomycosis is contracted through inhalation of a soil-born fungus. It is not transmitted from person to person. Therefore, it should be present at low frequencies and should be found primarily among tillers of the soil (presumably adults) (Widmer and Perzigian, 1981). While some representation of blastomycosis is certainly possible in this sample, the presence of the condition among very young children and in many people is more indicative of tuberculosis than of blastomycosis. It is very difficult to estimate the precise incidence of skeletal changes due to tuberculosis, but I have tentatively estimated that at least eight children and eighteen adults were affected (Pfeiffer, 1984).

A SYNTHESIS

Clearly, no single element of an ossuary analysis tells a very complete tale. At Uxbridge, the poor quality cortical bone may have directly influenced the frequency of vertebral compression fractures. Lesions caused by tuberculosis may have lead to compression fractures as well. Any nutritional deficiency that contributed to the poor quality bone tissue may have directly influenced the incidence of tuberculosis in the population. And how does warfare fit into the picture? It may have affected diet and disease factors in several ways, such as village crowding, interruption of subsistence activities, inflammation of wounds, and breakdown of social support systems.

Various estimates are available of how often tuberculosis affects the skeleton. They range from 1% of all cases (Daniel, 1981) to 5-7% of all cases (Steinbock, 1976). Using a rather high figure of 5% for skeletal involvement, the 18 skeletal cases at Uxbridge represent 257 cases of tuberculosis. If we use the most conservative estimate of incidence (1%), the 18 cases represent 1800 cases of tuberculosis, or simply "everyone" in this population with an estimated size of approximately 1200 (Pfeiffer, 1983).

A hundred years ago in the United States, there were two peaks in the age distribution of tuberculosis mortality, one in infancy and a higher one at 25 to 30 years of age (Bates, 1982). As mortality from tuberculosis declined, these peaks disappeared. While it is difficult to say anything about infant mortality in an ossuary sample, the mortality profile of Uxbridge as compared to Ossossané could be interpreted as showing a peak in the 25-30 year period which could have been caused by tuberculosis mortality. Of course, it may not be reasonable to expect this prehistoric population to follow a mortality pattern like that of an industrialized nation. Modes of exposure to the stressors which might escalate a dormant case of tuberculosis into a virulent, fatal condition were probably quite different.

Historic studies of tuberculosis do allow some generalities, however. The disease is likely to have occurred most commonly as an epidemic wave. The peak of such a wave could be exacerbated by warfare, crowding and a poor diet (Dubos and Dubos, 1952). These factors may all interact, of course, and may all have had some influence on the health of the Uxbridge inhabitants.

The presence of many tuberculosis lesions in a particular sample does not necessarily mean that tuberculosis caused more deaths in that sample. As a group acquired resistance to the disease, more individuals would survive the primary infectious stage and develop secondary symptoms such as skeletal involvement (Palkovich, 1981). Thus there are many complications that frustrate any expectations of simple changes in mortality accompanying evidence of a particular infectious disease.

Nothing about its demographic characteristics would alert us to sharply increased mortality within the Uxbridge population. It is the study of morbidity that makes the sample look unusual. There is currently no reason to argue that all other Iroquoian populations from this time period suffered nutritional stress (see Katzenberg and Schwarcz, 1984, and Katzenberg, this volume). Clearly, not all of the populations studied to date suffered from tuberculosis, though at least one other one did (the Glen Williams Ossuary, Hartney, 1981). The morbidity characteristics of Uxbridge appear to be unique. Why is its demography not also unique? Perhaps other ossuary samples represent populations coping with other stressors: different, but just as serious. Or, perhaps our demographic indicators are not sensitive enough to differentiate subtle differences among samples.

If Uxbridge is representative of Iroquoian populations during the late prehistoric period, then two questions are particularly perplexing: how could early European observers categorize the natives as "more healthy than we", (Thwaites, 1896-1901: 38-257), and note no particularly worrisome diseases? How can we explain the development of complex kin relationships and population growth within a population with such a low life expectancy (Howell, 1982)?

There is simply not enough information available from other ossuary samples to compare Uxbridge properly. We cannot say whether the Uxbridge sample is typical, sickly, or robustly healthy, relative to the Iroquoian population. We need more samples: complete, carefully excavated samples. Ideally, these samples should be associated with habitation sites about which we have information regarding number of houses, extent of palisade, etc. Many meaningful projects remain to be done with the Uxbridge sample. But even more pressing is the accumulation of information about variability in the Iroquoian population through space and time.

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THE MORTALITY OF ONTARIO ARCHAEOLOGICAL POPULATIONS

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Abstract: Huron ossuaries have been cited as providing excellent material for palaeodemographic studies. If this is so we should be able to follow with ease the mortality trend from 1400 to 1650, thus identifying the effect of European contact. Ontario sites are examined for their suitability for palaeodemographic study. Few sites provide good data and of those several appear to present anomalies indicative of sample bias. The remaining sites are examined by use of standardized life tables. This allows comparison previously impossible because of methodological differences and problems of age assessment. It is concluded that mortality at least doubled after 1610, but it is shown that there is reason to suspect adult underrepresentation especially, although not exclusively, in historic period Ontario sites. It is suggested that Ontario samples presently available for demographic analysis should not be regarded as totally reliable. Brief reference is made to Arikara data which appears to be potentially more valuable for contact studies.

Résumé: On a alléqué que les ossuaires Huron ont donnédes matériaux excellents pour les études paléodémographiques. Si c'est vrai, nous pourrions facilement suivre le mouvement de mortalité de 1400 à 1650, en établissant l'influence du rapport avec les Européens. On examine les emplacements dans l'Ontario pour estimer leur aptitude à une étude paléodémographique. Il n'y a pas beaucoup d'emplacements qui fournissent de bonnes données et il y en a beaucoup parmi ceux-ci qui semblent donner des anomalies qui indiquent un parti pris pour on contre les échantillons. On examine les emplacements qui restent par moyen des tables de vie qui sont uniformisées. Cette manière d'agir permet la comparaison qui n'était jadis possible à cause des différences méthodologiques et des problèmes en estimant les âges. On conclut que la mortalité s'est doublée au moins après 1610, mais on démontre qu'on peut soupconner de la sous représentation parmi les adultes en particulier, mais pas exclusivement, dans les emplacements dans l'Ontario pendant la période historique. On suggère que les échantillons dans l'Ontario que sont disponibles en ce moment à l'analyse démographique ne doivent pa être acceptés totalement sans reproches. On fait mention brièevement de la donne Arikara qui paraît être potentiellement plus importante pour les études de rapport.

Key Words: **Ontario Iroquois, Palaeodemography, Contact Period, Ethnohistory.**

INTRODUCTION

It is an article of faith among Ontario physical anthropologists that the Huron and Neutral burials of Ontario provide excellent sources of data for demography. This is true, in that we are provided with reasonably large samples representative (we assume) of a relatively short period of time, thirty years and less. Because the time element is controlled to some extent we can also infer that, apart from war captives, those buried had some social and probably biological relationship to one another. The social and biological relationships are in fact not known with certainty, but it seems reasonable to suggest that those together in death, following elaborate community ceremonials, formed some corporate social unit in life.

The period during which large Huron and Neutral burial features were established was actually very short: from the beginning of marked dependence upon cultigens (ca. 1300 A.D.) to the destruction of Huron and Neutral society by the Iroquois (ca. 1650 A.D.), following upon the disruptive effects of European contact.

The geographic and chronological position of each skeletal sample must be known if Huron and Neutral burials are to be useful subjects of osteological research. It seems reasonable that Ontario populations living in the period before European contact, would have had different mortality rates from those of populations during the period from 1600 to 1650. This is the hypothesis to be tested.

Enquiry into the mortality patterns of populations through time is essential to the anthropological understanding of a group. The age structure of a population has a strong influence upon its social and cultural organization. This living age structure is a reflection of the interplay of nutrition and pathology, those factors which determine the age distribution of deaths. The age structure of a sample is so basic that it must be determined before the examination of growth patterns, sexual dimorphism, metric and non-metric variation and degenerative and pathological processes is undertaken. Study of the mortality pattern of a population is basic to an understanding of that population.

Huron ossuaries are large burial pits containing many individuals most of whom are disarticulated and mingled. Although they have been considered excellent sources of data for palaeodemographers (Howells 1960; Ubelaker 1981), and even though Huron burial patterns are fairly well known from Jesuit accounts of a burial at Ossossané

(Thwaites 1898 10: 279-305; see also Tooker 1964 and Trigger 1969, 1976), the amount of information available may mislead us into thinking we know more than we do. There are many questions not yet answered or for which the answers seem ambiguous. What social unit does an ossuary represent? How representative of the social unit is the sample? Is it possible that many subadults (not just infants) were buried elsewhere?

Ethnohistory and osteology may give rise to conflicting reconstructions as, for example, in the case of sex ratios of Huron ossuaries. Young males should be underrepresented since it is said that those who died by violence or by drowning were not buried in the ossuary. Young men were also likely to die away from home, while hunting, trading or on war parties. However, in three cases there appear to be equal numbers of males and females: Kleinburg (Pfeiffer 1979) probably had a sex ratio of about 1:1 and this is also true of Fairty and Garland. In other sites there are more females than males among the dead. Ossossané has a male/female ratio of .94 (Katzenberg and White 1979), but the majority of males were apparently young (between 20 and 30). It seems that Maurice had many more females (.73; Jerkic 1975), and both Uxbridge (.83; Pfeiffer 1983) and Tabor Hill (.54 - the value is based only on skulls; Churcher and Kenyon 1960) may follow the same pattern. Sex ratios derived from ossuary material may well be subject to systematic errors; the first assessments for Kleinburg (Jackes 1977; Pfeiffer 1974; Saunders 1974) consistently gave the impression that 60% of the adults were females. Are we seeing a cultural practice reflected, or differential preservation, or errors in sex determination?

By comparison, Neutral burial grounds have not been excavated and studied to the same extent. Neutral burial practices are less well understood than those of the Huron, due to their complexity and to the lack of French knowledge of Neutral life in the seventeenth century. We assume that fairly limited time spans and restricted source areas apply to the Neutral as to the Huron, but we must be aware that both the source population and the duration of use of a Neutral cemetery are unknown. Fox and Kenyon (1982) suggest a time span of 30 years for the Neutral Grimsby cemetery, which may be double that of a Huron ossuary. But even if Neutral cemeteries cover relatively longer periods this does not make Neutral burial sites any less useful than those of the Huron in palaeodemography. Indeed, when short time spans are involved, short-term fluctuations may be reflected in the age distribution of the dead.

There can be no doubt that Neutral and Huron burial practices differed basically. For example, at Grimsby, all bodies were in more or less the same state of disarticulation, but without any cut marks. This is in strong contrast to the Huron ossuary at Kleinburg in which many of the proximal femora and cervical vertebrae had the score marks of disarticulation.

Finally, there may be apparent demographic differences between the Neutral and the Huron which are artifacts resulting from the different anthropological research techniques that are required by the varying burial practices. Huron disarticulation of the dead prevents the reconstruction of individuals. To estimate an age distribution, one must first estimate a minimum number of individuals and then juggle dental, pubic and other data of potential value to age assessment. One cannot use whole skeletons, checking one method of age assessment against another, giving due consideration to pathological and other relevant conditions. The Neutral practised multiple interment rather than ossuary burial, and while most skeletons are completely disarticulated, individual bundles are generally retained and not inextricably mixed as in a Huron ossuary burial (Hartney 1978; Jackes 1982; White 1966). This allows the possibility of more accurate age assessment.

THE AIM

In this paper I wish to examine the suggestion that Huron and Neutral burials of the period 1300 to 1650 A.D. are useful sources of palaeodemographic information which can be used to distinguish precontact from contact mortality.

Palaeodemography is the study of the age distribution of deaths through the use of life tables. While fertility rates are sometimes estimated, I do not believe they can be accurately assessed in palaeodemography using present methods of age estimation. The use of life tables has been criticized by Angel (1969: 428) but I think that the mortality quotient (q) derived is of comparative value. More basic criticisms have been made by demographers (Howell 1982; Petersen 1975) and recently Bocquet-Appel and Masset (1982) have stated that palaeodemography is a futile study. There is very little doubt that it is virtually impossible to estimate the age of adults over age 25 with much accuracy. As an example of the problems one need only refer to Meindl, Lovejoy and Mensforth (1983). This study was based on the comparison of real and estimated ages on a sample of known ages. Careful age assessments led initially to 41% correct age assessment by decade in individuals over age 20 (1983: 81). Review of methods led to 58% of age estimates falling within the correct decade, but at the expense of accuracy for the 20-30 and 50-60 year age categories. Comparison of the survivorship curves for the chronological and estimated ages lends dramatic support to the position of Bocquet-Appel and Masset. The study did not fully examine the problems of assessing the age of elderly individuals nor did it consider the particular problems of assessing the age of females to which Suchey (1979) has drawn attention.

To ignore the wealth of data provided by archaeological populations because of the difficulties is not acceptable. The difficulties must be circumvented. One solution lies in emphasis on the age distribution of those under 25 years of age. However, the mortality quotients for subadult ages are determined in part by the representation of adults in the sample. Therefore, it is imperative that there be complete excavation, full study of the entire sample available and reporting of all adult individuals. Exclusion of adults (e.g. those of indeterminate age and sex) will bias the result of any palaeodemographic analysis.

THE SITES: MATERIAL

Huron Ossuaries

Fairty

Fairty has been dated indirectly by association with the Robb Site for which Kapches (1981) suggests a date of between 1300 and 1350 A.D.. Anderson (1961) published Fairty as a pioneer effort in the full osteological analysis of an ossuary. He was cautious not to overstate the accuracy of his age estimation techniques and thus gave percentages for broad categories. He stated that 28.3% of the population was aged 24 to 29 (I used 23 to 29) and that 21.5% of Fairty people were aged 30 and over. Melbye (1981) attempted to distribute the Fairty adults more evenly from age 20 to 80. I believe that present ageing techniques do seriously underage adults, but I use an age distribution for Fairty which is closer to Anderson's original in order to facilitate comparison with other sites.

Garland

The date of this ossuary is uncertain. On the basis of a trade bead it may date between 1500 and 1550 A.D. (see Molto 1980: 92). Webb (1969) analysed the skeletal remains, noting that he received the material 10 years after it had been excavated, in a semi-sorted state, with few bone fragments present. The data from Garland are used here only in the form of cumulative percentages (Table 3), and they are very close to the almost identical pair of Fairty and Grimsby.

Kleinburg

No information on Kleinburg demography has yet been published except as mortality and survivorship curves by Katzenberg and White (1979). They state that the data were unadjusted but in fact the data had been adjusted for infant underrepresentation (Pfeiffer 1974). Jackes (1977) provided demographic information based on atlas and axis vertebrae. Pfeiffer (1984) has also worked on femoral cortical remodeling using Kleinburg material. Kleinburg demographic analysis must await full study (see also Pfeiffer this volume). The ossuary is dated to between 1580 and 1600 A.D. (Melbye, personal communication) on the basis of a limited number of trade goods. Villages known in the adjacent area are all dated to 1550 A.D. or earlier (Kapches in litt. 1984).

Maurice

This ossuary was studied by Jerkic (1975) who states that it dates to 1640 A.D.. In view of its apparently low mortality rates it is difficult to accept that the ossuary represents a period during which two severe epidemics and sundry episodes of famine are known to have occurred. The cumulative percentage profile for Maurice is very similar to Kleinburg (Table 3), and were it not for the abundant trade goods, the demography would suggest an earlier date for Maurice. The fact that the q values from ${}_5q_0$ to ${}_{25}q_{20}$ hardly vary around their mean of .05 suggests that the sample may be very incomplete and this is supported by the excavator's report that the ossuary had been potted several times before proper excavation.

Ossossané

This site can be dated with relative certainty to 1636 A.D. (Kidd 1953: 373), and the ceremonies that took place there are believed to be described by Le Jeune (Thwaites 1898 21: 293-305). This burial followed a period of great stress to the Huron. The year 1634 saw an epidemic whose nature is unknown (Jackes 1983), a period of famine and a major unsuccessful raid against the Seneca. The available data may not be very sound, for the site was dug in 1947-48 but not analyzed until the late 1970s and full studies have yet to be published. Nevertheless, the similarity of the mortality pattern to that of Grimsby (see below) may indicate that we are able to pick up the mortality trend of the post-contact period (relatively low childhood mortality and increased adult mortality).

Tabor Hill

The Tabor Hill study (Churcher and Kenyon 1960) was the first published attempt at the analysis of an ossuary. It is thus not surprising that the study provides no data suitable for inclusion here. All we can say is that 30% of the population died by either age 10 or age 16. The excavation, in 1956, was a salvage project.

Uxbridge

The ossuary has been excavated and analyzed with great care and a demographic study is available (Pfeiffer 1983). The suggestion that the population had an extremely high incidence of tuberculosis is supported by the demographic profile, in so far as the q values for ages 15 to 30 are concerned.

Neutral Cemeteries

Grimsby

Grimsby was excavated as a salvage operation in 1977 and the analysis was done at great speed prior to reburial of the bones. The excavation of this site represents one of the few complete excavations of an almost undisturbed Neutral cemetery. It is thus very difficult to make statements about the demography since Neutral burial practices are poorly understood and the multiplicity of types of interment at Grimsby make it a very complex site (Kenyon 1982). The burial practices were quite unlike those of the Huron and there seems to have been selection of individuals by age and sex for burial in certain multiple graves (Jackes 1982). Fox and Kenyon (1982) have suggested that the cemetery represents people from a wide area dying over a number of years.

Shaver Hill

Demographic data for this Neutral cemetery are available only in their broad outlines (Stothers 1971). It seems possible that infants and children are very underrepresented. The data indicate that 36% of the population died between the ages of 10 and 20 which makes Shaver Hill a unique case. I have not used the data from this site in the analysis below. The q values are as follows: .080 (q_0): .087 (q_5): .167 (q_{10}): .314 (q_{15}): .375 (q_{20}).

Several other Neutral cemeteries are of potential demographic value. Of these, Glen Williams is the most important. Unfortunately, the subadult age distribution for this site is not known, although an adult age distribution has been published (Hartney 1981a, b). I have estimated an age distribution on the basis of the mandibles (Hartney 1978). The maxillae provide a larger sample but the minimum number of individuals represented is uncertain. The Glen Williams q values of .201 (q_0): .084 (q_5): .087 (q_{10}): .085 (q_{15}): .116 (q_{20}) indicate low mortality. The Milton Site (Hartney 1978) provides incomplete information on a disturbed and damaged sample. Information is available on the age distribution of 243 individuals of the 369 excavated from the Orchid Site (Cybulski 1966, cited in Hartney 1978). This indicates low mortality and extreme infant underrepresentation: .059 (q_0), .063 (q_5), .067 (q_{10}), .060 (q_{15}), .118 (q_{20}). The Orchid Site was excavated as a salvage operation of already damaged material. It is not definitely Neutral, its dating is uncertain (see, e.g. Molto 1980; Patterson 1982), it may be multicomponent (White 1966), and there is still discussion over its stratigraphy (Noble, personal communication, 1982). Additional information on all sites discussed here is given in Table 1.

THE METHOD

Standardized life tables have been used here to facilitate interpretation. The demographic information has been prepared by casting the data into five year age categories from 0 to 24.9 years of age (this can be accomplished through equal distribution of individuals over all years in an age category or, as here, by reordering on the basis of graphed cumulative percentages). The final age category, which includes all other adults, is 25 years to some arbitrary final age, and deaths are treated as being evenly distributed over the years included in this category.

The breadth of the final category could be adjusted using a regression formula (see Table 7), for there is a high correlation between the final age which gives the correct ${}_5e_0$ for model and historical life tables and the juvenile/adult ratio proposed by Bocquet-Appel and Masset (1982). This method of estimating ${}_5e_0$ ignores the problem of infant underrepresentation, but this is justifiable. For example, the category ${}_5AD_0$ must include 360 individuals for the infant and early childhood representation to have an effect on the average age of death which equals the effect of only 20 adults in an adult category set at 25-65 . If those 20 adults were in an age category set at 25-75 , it would require 400 individuals under 5 years to equal their effect upon the average age at death. As another illustration of this, we would have to increase the Maurice sample by 517 individuals under 5 years of age, in order to equal the effect on the average age of death of raising the final age fom 65 to 81 years.

For the purposes of this paper the adult age category is set at 25-65, unless it is specifically stated otherwise. While 65 may be an appropriate final age for high mortality populations, it is used here simply to facilitate comparison and no statement is made regarding the supposed life span of the populations under consideration. Rather, this paper will explore the possibility of estimating mortality levels despite the fact that the length of life cannot be determined.

The data used are in all cases those which have not been smoothed or initially adjusted, and the standardized life tables thus produced allow comparison of basic statistics. The method of calculating the life tables is standard but the formula for ${}_5L_0$ $((l_0+l_5*5)/2)$, which assumes equal distributions of dead over the period from birth to 4.9 years, is probably used only by palaeodemographers. It has the value of compensating for infant underrepresentation in the life expectancy at birth or average age at death calculation.

Using standard scores (Z) of q values for a large number of cemetery populations both within and beyond North America, concentrating on the four 5 year age categories between 5 and 24.9 years of age, three basic mortality patterns are distinguishable (Table 2). The low mortality group (Group L) is characterized by a mean infant and early childhood mortality rate (here ${}_5q_0$ and not ${}_1q_0$) of 22 to 28. The ratio of 5-14.9/20+ (proposed by Bocquet-A ppel and Masset 1982) has a mean of .159, and those over 25 years make up 53-57% of the dead.

The second pattern of mortality (Group I) applied only to published data from Arikara sites and a number of sites in the Illinois and Mississippi basins. They all show high mortality among infants and young children. Since no Ontario sites fall within this category, I will not describe it further. It is, however, a general mortality category into which many American and other archaeological populations fall when analysis is based on a very large number of sites.

The final category (Group A) is one into which very few sites fall and it is significant that three of these are Fairty, Ossossané and Grimsby, which always group together, whatever the method of analysis or the number of variables used. There is a very specific marker for this final mortality category, namely a high percentage of adolescent and young adult deaths. The 10-20 year age group constitutes 15 to 16% of the dead, whereas in those cemetery populations with low mortality or even high early childhood mortality, adolescents make up only 8-10% of the sample. Characteristically, in this grouping with high adolescent mortality rates, ${}_5q_0$ is quite low, the mortality rate being 27 to 32 per thousand (compare this to the Arikara value of 52).

The low childhood mortality rates are not necessarily anything more than a reflection of bùrial practices or differential preservation. The exclusion of infants from Huron burials is an accepted fact (Thwaites, 1898 10: 273; Kapches 1977) and one which is supported by this study. For example, Table 3 shows the cumulative percentages of the dead up to age 25 for a number of North American skeletal samples. In analyses of the data all differences are overridden by 0-5 representation and thus Ontario site s group by themselves, together with a few United States sites deficient in infants (e.g. Turner contains no individuals under 12 months of age, cf. Black 1979).

Adjustment for infant representation is essential if any comparison based on ${}_5e_0$ is required. Adjustment cannot

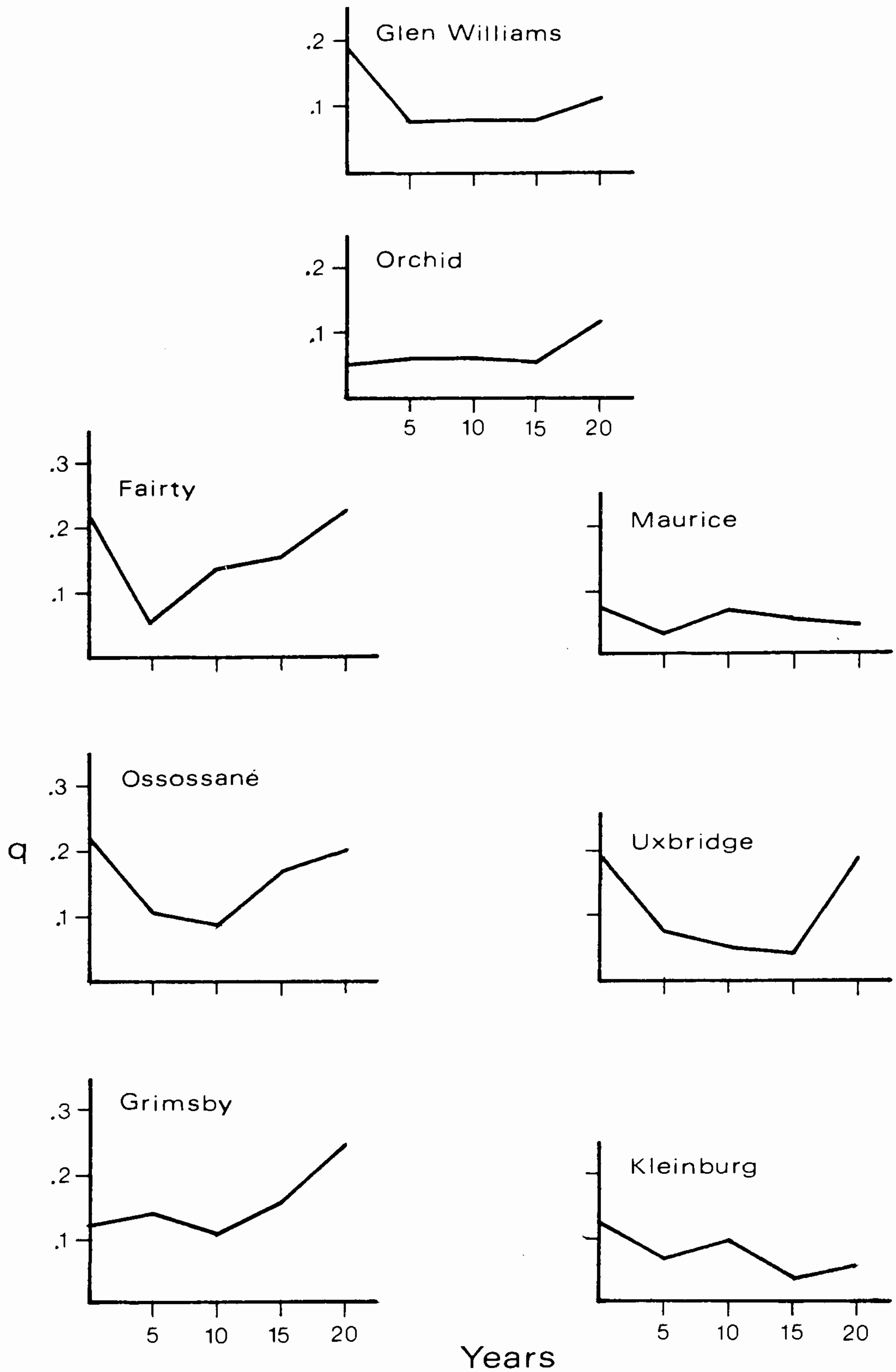


Fig. 1 Mortality curves for Ontario sites.

be accomplished through regression or use of model tables (which would require unwarranted assumptions about infant mortality) and so here it is achieved by use of the mean q value for ${}_5q_0$. The mean q values are derived from 28 American archaeological skeletal samples which were differentiated into the three individual mortality groups previously mentioned. The mortality pattern groups were established through cluster analysis of standardized q values (z-scores) and checked by principal component analysis (Nie *et al.* 1975 and Wishart 1978). The adjustments thus relate to specific mortality patterns and are not arbitrary. The adjustments used are very conservative: .311 for the high mortality group and .277 for the low mortality group. The value of .311 is used for Fairty, Ossossané and Grimsby and it derives from the mean of the Midwest sites in the high mortality group (Libben: Lovejoy *et al.* 1977; Schild Late Woodland: Droessler 1981; Dickson Late Woodland Acculturated Mississippian: Lallo 1973). It is virtually equivalent to the Libben value. The value of .277 derives from several low mortality Midwest sites, Nanjemoy (Ubelaker 1974) and Point of Pines (Bennet 1973). The low mortality pattern is equivalent to West Level 3 (Coale and Demeny 1966), at which level ${}_5q_0$ would be .473. Coale and Demeny's high levels of mortality for the West family are themselves estimations and it appears possible that they overestimate infant mortality, at least with regard to North American archaeological sites. I regard the problem of infant adjustment as insoluble and use the method suggested here only to allow the comparison of palaeodemographic data.

THE RESULTS

The Ontario sites in the high mortality category are Fairty, Ossossané and Grimsby. Those in the low category are Uxbridge, Kleinburg and Maurice. Two other Ontario populations may provide data good enough for us to use here. These are Glen Williams and Orchid and both appear to fall within the low mortality group. Were it not for Fairty and Maurice, we could say that lower mortality is characteristic of the pre-contact group of sites and high mortality characterises the contact period grouping.

Differences in pre- and post-contact mortality do not explain the available evidence on Ontario palaeodemography. Maurice may well be a sample that we should exclude on the grounds of bias. I have already noted the unusual q values for this site and this is graphically illustrated in Figure 1. The virtual equivalence of the 0-5 and 10-15 age group mortality rates makes bias a certainty. Fairty is a much more problematic site. Of all the sites I have examined, both North American and other, I have found no other in which very low 0-1 values are followed by, in succession; high 1-4, extremely low 5-10, uniquely high 10-15, and very high 15-20 and 20-25 values. There is thus a possibility that the Fairty sample does not provide good demographic data.

Fairty can be viewed in several ways. First, there is some evidence from the United States, specifically at Schild, Dickson Mounds, and Libben, that sites dating to the Late Woodland period (just prior to the introduction of a greater degree of dependence on cultivated plants) had elevated mortality. Fairty may be included in this grouping. The populations of such sites may not have been in demographic equilibrium; they may not have been stationary. Lowered representation of infants among the dead and an increased proportion of older individuals would be the mark of such populations, precisely as is found for the high mortality group. It is, of course, reasonable to suggest that Grimsby and Ossossané are also samples of populations in decline.

The Carrier (1958) method of estimating the demographic parameters of non-stationary populations is often used in anthropological research. The method as used here is outlined in Table 4 and checking it (by use of the formula $D_x(1\text{-}r)^{a,b}$) against the values derived from the Coale and Demeny model tables (West Family highest mortality levels) shows that the method is reasonably accurate. It gives, for r= -.01%, something in fact just less than that level of decline. Adjusting Fairty according to this method does not, however, alter the basic aberrant mortality curve (the general form of the curve remains constant whatever value is given to r).

One further method of adjustment would be to assume that the Fairty representation of adults is deficient. Since q values are altered by the proportional representation in the following, not the preceeding age categories, q values are affected by adult representation in just the same way that survivorship is affected by infant representation. Increasing the adult sample size does indeed bring Fairty closer to other sites, but we cannot simply assume that Fairty is unique because of adult representation. Indeed all sites which fall into the high mortality category have an extremely high representation of individuals between 10 and 20 years. Fairty, with 20% in this age category, has the highest representation of adolescents of any site examined, but Grimsby and Ossossané (and Schild, Late Woodland) are not far behind. The question at issue is the cause of this apparent high adolescent mortality, unparalleled in the demographic literature.

There is no evidence that the high mortality group is simply a result of consistently inaccurate age assessments. The information on Libben (Lovejoy *et al.* 1977) and the methods employed there (see Meindl, Lovejoy and Mensforth 1983) and the data on the two components of the Schild site, Late Woodland and Mississippian (cf. Droessler 1981), all indicate something other than problems of age estimation. Individuals between ages 10 and 20 would be expected to have a low risk of mortality, except perhaps for instances of trauma and childbirth. With Fairty there is no reason to expect some unique infectious disease or other single factor as the cause of death. Rather, the very low ${}_5q_5$ value suggests bias in the sample.

MORTALITY AND THE CONTACT PERIOD 1620 - 1650

We may legitimately assume that the demographic profiles of Grimsby and Ossossané reflect in some manner the documented epidemics of infectious diseases introduced among the Huron and Neutral, mostly through the agency of French fur traders and priests. It is extremely difficult to define the nature of the epidemics which it is believed devastated the populations of the coastal regions of Canada and New England. There is firm evidence of smallpox in New England in 1633 and among the Mohawk in 1634, and there is also possible evidence of smallpox osteomyelitis among the Neutral by at least that period and possibly before (Jackes 1983). In virgin soil populations, as in all populations, those aged 10 to 20 are the least likely to succumb to smallpox (Dixon 1962).

Measles and/or chicken pox may also have attacked the Indians of Ontario in the 1630s but these diseases have a characteristic U-shaped mortality curve (youngest and oldest people most affected). Perhaps only the 1918-1919 influenza epidemic (Burnet and White 1972: 97) and respiratory tuberculosis (Preston 1976) are known to have been particularly dangerous to late adolescents. A disease which has been interpreted as influenza (Trigger 1976: 526) afflicted the Huron in 1636, causing many deaths at Ossossané but not until the autumn following the May Feast of the Dead. There seems little doubt that the unusual demographic profile of Uxbridge (Pfeiffer 1983) is partly attributable to the effects of tuberculosis, but there is no similar evidence of bone pathologies indicating unusually high tuberculosis incidences in the Grimsby and Ossossané samples.

We know with reasonable certainty that the people of Ossossané were in close contact with the French. We know too that those of Grimsby were specifically excluded from sustained contact with the French by the Huron. Nevertheless, contact had occurred. The Grimsby cemetery contained the skeleton of a high status Neutral woman who was in all probability fathered by a European (Jackes n.d.; Kenyon 1977).

The Grimsby cemetery

Our understanding of this site is hampered by several unresolved problems of interpretation which we must examine before embarking on a demographic analysis.

Can the cemetery be analyzed as a single demographic unit?

Fox and Kenyon (1982) suggest that the cemetery represents a span of about 30 years, covering the period of contact. On the basis of trade beads they distinguish three phases (II, IIIA and IIIB), each about ten years in duration. The Grimsby skeletons should then allow us to discern differences in mortality over the contact period. It might be possible to differentiate the initial impact of introduced diseases from the final period in which social breakdown overtook infectious disease as the main cause of mortality. Phase II is represented by only 26 individuals, too few for analysis. There are 114 individuals identified as belonging to Phase IIIA and 106 individuals in Phase IIIB.

Of the individuals in Phase IIIA, only 23% are age 25 years and older. Thus, the mortality profile for Phase IIIA shows an exceptionally early mean age of death. Phase IIIA includes two graves, Features 9 and 11, that contain large numbers of subadults. Therefore, the high mortality curve may be a function of sample bias. If the frequency of adults over 25 is increased from 23% to 43%, the resulting q curve is almost indistinquishable from the q curve for the total Grimsby sample. Could the lack of adults be the result of the initial impact of epidemics?

It is unlikely that the epidemics of 1630 to 1640 would result in an age distribution of deaths in which 26% were adolescent and only 23% over age 25. This pattern has not been documented for any smallpox epidemic and is improbable for any other form of epidemic.

During the smallpox epidemic in Iceland in 1707, in which almost 95% of the population contracted smallpox and 25% died (Steffensen 1977), 19.4% of the deaths were among those aged 10- 20, whereas 60% of those who died were 25 and over. Similarly, during the epidemic at Anyho in Northamptonshire from September 1723 to December 1724, 16% of the deaths were in the 10-20 age group and 56% were among those 25 and over (Creighton 1965 2: 520). The distribution of Phase IIIA deaths is inconsistent with such patterns. The probable cultural significance of the distribution is underlined by the fact that 80% of the 25 sexed adults in Features 9 and 11 were female. In the two epidemics mentioned above there was no difference in mortality between the sexes.

Phase IIIB (n = 167) includes two large graves, Features 1 and 62. Feature 62 contained 103 people in an elaborate oval arrangement. Within the oval it is possible to discern groupings by interacting factors: status, physical condition with reference to disability, genetic ties, sex and age. The grave did not contain many juveniles, but did have many males and older females. It seems likely that this grave represents a cultural rather than a biological phenomenon. On the other hand, Feature 1 contained 16 or 17 individuals and seems to represent the disorganized, hurried burial of the dead from one specific short period. The mortality profile for Phase IIIB is very similar to the overall mean mortality curve for the 7 sites with high mortality that form Group A (Fairty, Ossossané , Libben, Grimsby, Mobridge 2, Dickson Late Woodland Acculturated Mississippian, Schild Late Woodland).

The pattern suggested by Features 9, 11 and 62, namely that women and children were buried together much more often than men and children, may well characterize Grimsby burial practices (Jackes n.d.). Older men especially were most often buried together and separated from children. It thus seems very unlikely that we can derive demographic meaning from the distribution of individuals in graves. Although 83% of individuals have been assigned to a time period, it does not seem likely that we can distinguish mortality differences between one period and the next. Table 5 demonstrates that at Grimsby significantly more adult males than females were buried in Phase IIIB graves and significantly more older individuals (both sexes) were buried in Phase IIIB. This confirms the general impression that males, especially older males, were separated from subadults in burial. The distribution of bead types is thus perhaps not controlled by time alone but also by other factors such as status association.

Since the Phase IIIA and Phase IIIB individuals together provide a demographic profile (age and sex distribution) which is biologically possible, it may be reasonable to assume that the demography of the total cemetery adequately represents the mortality of the last 20 years of Neutral occupation in the Grimsby area.

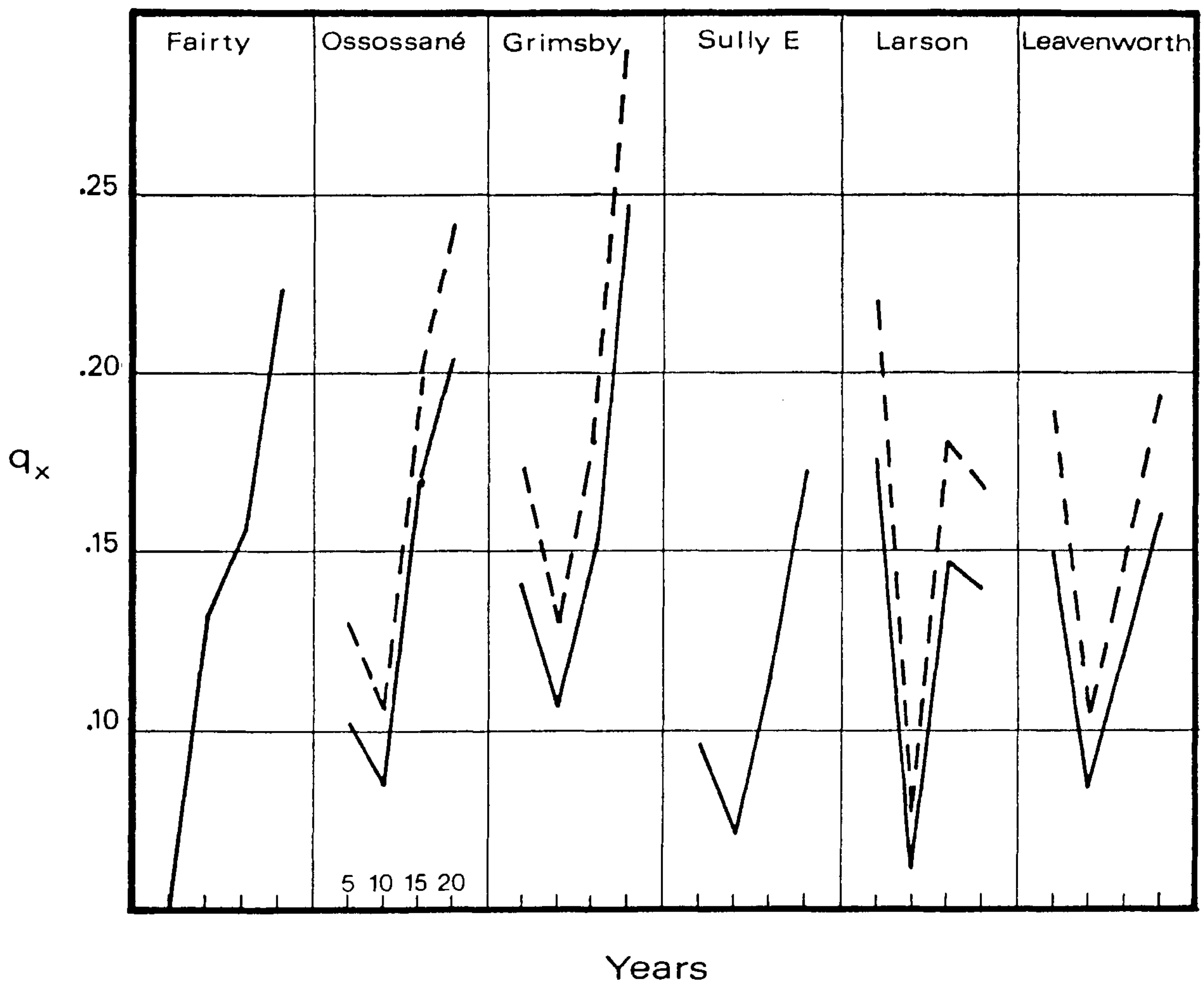
Does the cemetery represent a social unit from which useful demographic data could be derived?

Fox and Kenyon (1982) suggest that Grimsby might be a ceremonial centre rather than a village cemetery. If they are correct, then we would have a very biased sample of the dead, with many high status males and quite a few high status older females. Although status does seem to underlie the Grimsby burial patterns, it is not possible to demonstrate specific biases for the entire cemetery. There are biases, but they are generalized. Nothing indicative of an extraordinary burial pattern by age and sex is seen at Grimsby. Figure 2 compares the standardized *q* curves for Grimsby with those from other high mortality or contact sites; the Arikara village cemeteries (data from Bass *et al.* 1971; Owsley and Bass 1979), Ossossané and Fairty. Only Fairty has an abnormal pattern.

What was the duration of the cemetery?

Neutral villages may have been inhabited for longer periods than Huron villages which were shifted every 8 to 15 years, at which time a Feast of the Dead was held (see e.g. Thwaites 1898 10: 275). Assuming that soil fertility and availability of wood, together with the degree of dependence on cultigens, are the deciding factors in village mobility, the geographical characteristics of the Neutral region are important to note. In 1626, Daillon (LeClercq 1881: 269, 270) was impressed by the richness and temperate climate of the Neutral country as was Charlevoix (1766 2: 201) almost one hundred years later. Daillon (LeClercq 1881: 270) notes that the Neutral were able to grow a surplus of corn. In fact, soils which are well suited for growing corn are more abundant in the Neutral region than in Huronia (compare Hoffman *et al.* 1962: 84 and Presant *et al.* 1965: 38, and see also Wicklund and Matthew 1963 for information on soils and climate). Modern records show that the average number of frost free days

Fig. 2 Comparision of *q* curves for high mortality sites at $r = 0$ (solid line) and $r = -.01$. The mortality quotients are plotted for ages 5 to 20 and illustrate the basic similarity in all curves other than Fairty.



per year is higher. There is no reason to suspect that these differences would have been any less marked in the seventeenth century. The good soils and climate encouraged the heavy hardwood forest cover of the area and game abounded. The Jesuits noted the importance of the hunt to the Neutrals (Thwaites 1898 21: 195-197) and this, as well as the importance of gathered food is confirmed by archaeological studies (Wright 1981: 114, 131-132; Lennox 1981: 340, 360; Fitzgerald 1982: 20- 21, 31-31). Charlevoix recorded the opinion that cultigens were less important in the Neutral than in the Huron diet (1866 2: 152).

This suggestion is corroborated by stable isotope analyses (Katzenberg and Schwarcz, this volume). It may also be supported by studies of dental pathology (Patterson 1982).

Noble (1978: 160) argues that the Neutral stood at an important middle position at the ends of two major trade networks . Fitzgerald (1982: 281 ff.) discusses the archaeological evidence for both local and regional trade by the Neutral during both the prehistoric and historic periods. The geographic position of the Neutral and their neutral status certainly suggest that trade could have been important. The Neutral may have initiated trade in tobacco (Sagard in Wrong 1939: 151) and squirrel pelts (Thwaites 1898 17: 243, n. 8). Trade networks of this sort imply a measure of stability in settlement pattern.

If Neutral villages were not shifted with any regularity, there would be no clear termination for a cemetery. Thus, the Grimsby cemetery may well have been used for a minimum of 20 or 30 years, in contrast to the maximum of 15 years estimated for the historic Huron by the Jesuits (see e.g. Tooker 1964: 42).

Grimsby demography

In making demographic calculations I assume that the total Grimsby sample represents valid palaeodemographic data for the period 1630 to 1650. I assume that the population was in decline and I calculate average age at death ($_5e_0$) for r = -.01 by the Carrier method, using the mean childhood mortality rate of 31 per thousand. Use of the estimated $_5e_0$ outlined in Table 7 gives a birth rate of about 56 per thousand which approaches the normally accepted maximum human birth rate. It indicates that the life table average age at death ($e_0 = 17.8$) is unacceptable here as an estimator of birth rates though the life table crude mortality rate is possible. Since population size is calculated using e_0, population estimates may also be unreliable. However, on the basis of 10 villages, the Jesuits in 1640 estimated that the average Neutral village size was 300 (Thwaites 1898 21: 223). If the Grimsby cemetery source population was one village, we could estimate the size of that village as 353 with 20 deaths a year over a 20 year period. The 10 year estimate would be rather high at 703, but the 30 year estimate of around 237 is not impossible (13 deaths per year).

Huron demography and the Ossossané ossuary

Ossossané apparently represents the period from before 1623 to 1636 when the Huron were beginning to suffer the first impact of European contact. We have some idea of the population of Ossossané in 1623: Sagard mentioned 200 to 300 families (see Trigger 1976: 385 for a discussion of the identity of the 1623 and 1636 villages). Eight or nine villages are said to have contributed their dead to the burial pit in May 1636 (Thwaites 1898 10: 291). Using 15 years as the time limit of the ossuary, the population estimates are 422 for $r=0$ and 352 for $r=-.005$, too low if Sagard's figures were correct. Birth rates calculated from the life table are, for $r=0$, 45 and for $r=-.005$, 48 per thousand per year.

We should not expect Huron birth rates to be high. Famine, disease and social disruption were beginning to take their toll and the men were often away on hunting, trading or war parties. The Jesuits recorded birth spacing of 3 years (Thwaites 1898 8: 127) and it was later specifically noted by the French that Indian birth rates were not high (Charlevoix 1766 2: 201, "the women are far from being fruitful").

It is possible to get some idea of what the French thought of as low birth rates by examining several examples of rural French birth rates from the seventeenth and early eighteenth centuries. Life table birth rates can be calculated for two northern French villages (Mouliherne, see Lebrun 1971: crude birth rate (CBR) 36 per thousand for the eighteenth century; Tourouvre, see Charbonneau 1970: the CBR for 1670-1790 was 40 per thousand with 4.4 as the total fertility rate). From the work of Charbonneau (1975: 125), it is possible to construct a life table for the settlers in New France (1640-1729) by which we can estimate 3.3 as the total fertility rate. Charbonneau noted that the life expectancy in New France was higher than in France (p. 124). This leads to lower life table birth and death rates (around 28 per thousand). The crude birth rate calculated for New France is almost the equivalent of that published for the eighteenth century (30 per thousand) for another small northern French village (Daniel and Henry 1965).

Whether in New France or France itself, the calculated birth rates are lower than those calculated from skeletal series. The French data indicate rates of 30 to 40 per thousand, well below the rate calculated for Ossossané. An examination of 28 North American skeletal series shows that Maurice and Kleinburg (unadjusted data), lacking many infants, have the lowest birth rates (28 for Kleinburg). Other life table birth rates climb to impossible values; for example, among the Arikara of South Dakota where the rates may be above the physiological limit. They are also impossible because, for example, for Leavenworth we know that the population was declining rapidly (Meyer 1977). We cannot rely on the palaeodemographic data to give us birth rate estimates.

Comparison: Ontario Iroquois and the Arikara

I wish to make brief reference to Arikara samples, since these may provide better data than those available from Ontario for the study of mortality during the contact period. The Arikara villages of South Dakota, like the Ontario samples, have not all been studied to their full potential for demography: but the Leavenworth, Larson and Sully sites have been well enough published to allow their use in comparative demographic studies. To permit comparison, standardization is applied (adult age estimated by regression) and also the Carrier adjustment for non-stationary populations.

The three components of the Sully site have crude life table mortality rates of 44 to 46 per thousand between 1650 and 1700, before contact was fully established (r = 0). Sully is followed in time by Larson, representing the period 1679-1733 (Jantz and Owsley 1984) during which horses were introduced and trade goods became more numerous. Larson has a crude mortality rate of 83 per thousand ($1/e_0$ adjusted on the assumption of r = -.01). That was prior to the period when smallpox is known to have seriously affected the Arikara. Leavenworth, dating to the early nineteenth century, reflects the final impact of European contact, with a death rate of 67 per thousand (r = - .01). The trend in mortality for the Arikara is consistent with the recorded decline in population from 2000-3000 in 1826-1836 to 600-700 in 1876 (Meyer 1977). This trend in mortality makes sense in terms of the timing of contact and it suggests that smallpox epidemics may have occurred much earlier than the records suggest.

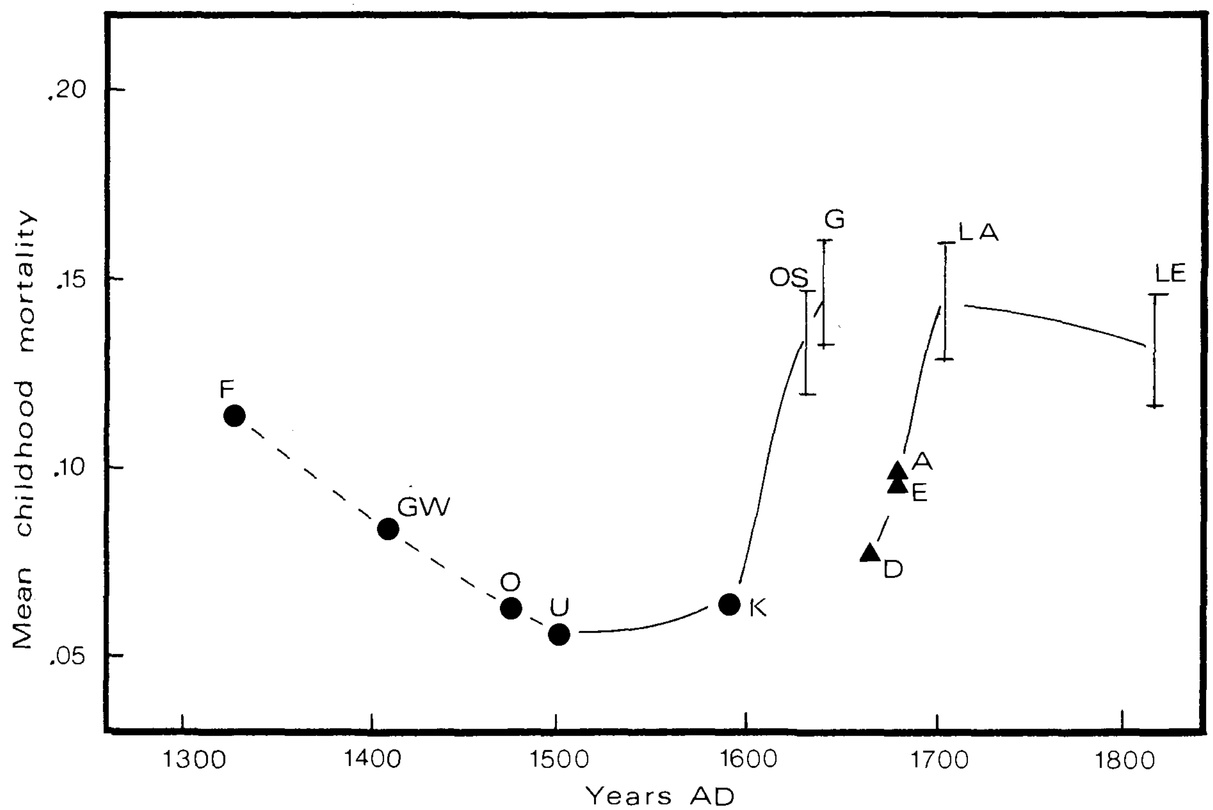
Arikara mortality rates were apparently much higher than those of the Ontario contact sites. The probable reason for this is that the Arikara sites appear to have full infant representation. This has the effect of markedly lowering $_5e_0$, thus increasing the death rate. At r = -.01, the $_5q_0$ for for Larson is .625 and for Leavenworth .527. Compare this with Ossossané beginning with $_5q_0$ adjusted to .311 and altered for r = -.005. The Ossossané value calculated under those conditions gives an early childhood mortality rate of .342. This is not a high rate: the equivalents for the French villages are .392 (Mouliherne) and .442 (Tourouvre). Thus we can only expect to see low estimated mortality rates.

Comparison among samples is, then, not possible using the standard method of estimating life expectancy at birth ($1/e_0$). This is partly because of infant under-representation, and partly because adult age distributions may be inaccurate. Here I have tentatively suggested methods of avoiding both problems, but I can claim no more than that the results are less inaccurate than in previous comparative studies. Another possible approach may, however, allow more accurate comparison and thus palaeodemographic analysis of mortality levels. The method is simple and consists of no more than establishing the mean childhood probability of death (i.e. the mean of q_5, q_{10} *and* q_{15}).

In low mortality populations like Uxbridge and Kleinburg, this value is between .05 and .07. Middle range mortality (and this seems to include Glen Williams) gives values of .07 to . 10. Larson, Leavenworth, Grimsby and Ossossané all fall between .110 and .132 (with Grimsby the highest). In Figure 3, the values for the Arikara sites of Larson and Leavenworth and for Grimsby and Ossossané are shown as ranges, each range illustrating the

Fig. 3 Ontario and Arikara mortality trends, estimated on the basis of mean childhood mortality. For Larson and Leavenworth, and for Grisby and Ossossané, a range of mortality based on r = 0 (lower) and r = -.01 (higher) is shown. Sully A. D and E probably predate direct contact and epidemics. Larson, as well as Grimsby, probably reflects the effects of smallpox epidemics.

Key: F - Fairty; GW - Glen Williams; O - Orchid; U - Uxbridge; K - Kleinburg; M - Maurice; Od - Ossossané; G - Grimsby; A - Sully A; D - Sully D; E - Sully E; La - Larson; Le - Leavenworth.



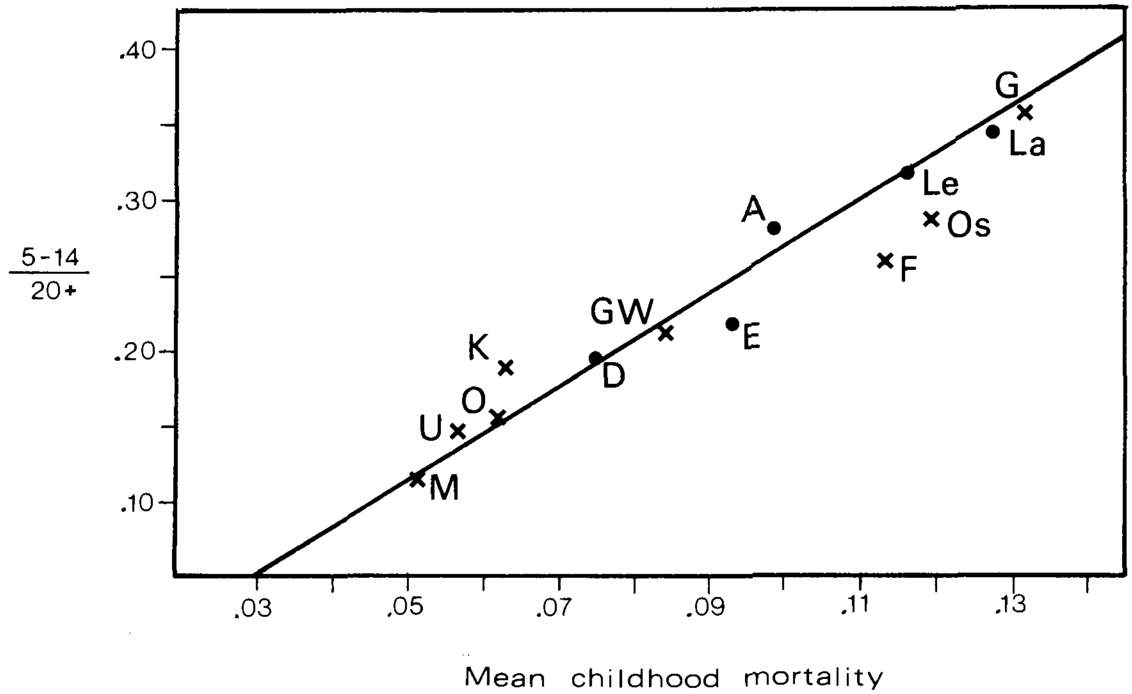


Fig. 4 Regression of juvenile/adult ratio on mean childhood mortality for 35 archaeological sites, both North American and Old World. Key to sites as for Fig. 3. Regression: slope = 3.0749; y intercept = -0.03988; r = .96.

spread between mean childhood mortality calculated for $r = 0$ and $r = -0.01$ when the adult age is set at 25-65 . The estimate for populations in decline gives the higher end of the range. The great value of this statistic is that it allows one to compare sites, over space and time, while avoiding the insoluble problem of infant underrepresentation.

Mean childhood mortality is highly correlated with the juvenile:adult ratio suggested by Bocquet-Appel and Masset (1982) since both values are based on the relative frequency of adults and subadults. For 26 North American sites, the correlation (r) is .96, and sites from the Old World fall on or close to the line established for the North American sites. Figure 4 illustrates the distribution of the Ontario and South Dakota sites about the regression line derived from data on 35 North American and other archaeological sites. The data used for this figure are not adjusted for $r = -.01$. The method illustrated in Figure 4 also allows the checking of data. For example, since the Shaver Hill juvenile:adult ratio is .458, while the mean childhood mortality is only .189, the age distribution is so unusual that it should be considered carefully before it is used in a comparative study.

Figures 3 and 4 show that Grimsby mortality is the equivalent of Larson mortality. These two sites evidently illustrate the effects of introduced diseases, a conclusion which could not previously be proved for Larson, but was highly likely for Grimsby given its terminal date of 1650. The people of Ossossané , it seems, had in the 15 years preceeding the spring of 1636, already begun to feel the effects of contact. The only recorded epidemic during that period is that of 1634, and we may infer that it raised mortality levels markedly.

CONCLUSIONS

I suggest then that:

1. Ontario generally provides disappointing material for demography, many sites being unusable (e.g. Tabor Hill).

2. Some sites are potentially useful but need more complete analysis (e.g. Kleinburg).

3. Some sites seem to have marked sampling problems which make deductions drawn from them suspect (e.g. Fairty).

4. All sites have marked infant underrepresentation which invalidates analysis and interpretation from any demographic parameter based on life expectancy at birth (average age at death).

5. Some sites are probably representative of populations in decline so that no statements on mortality rates can be made without an estimation of r.

6. There must be recognition of possible differences between Neutral and Huron burial practices leading (a) to demographic differences in the burial populations, and (b) to the possibility of different age and sex assessment methods

7. There must be some recognition of the possibility of overall sample bias, apart from infant underrepresentation.

8. I propose a standardization of life tables in 5 year age categories (0-4.9 etc.) and, after inclusion of all adults, analysis of childhood q values (q_5, q_{10}, q_{15}), avoiding the problem of infant representation. On the basis of this method I suggest the possibility of **at least** a doubling of childhood mortality between 1600 and 1650 (and thus adult mortality at that level or higher). I suggest that Southern Ontario had very low mortality (in terms of North American archaeological sites) up until 1600. By 1640 Ontario mortality was about the same as that of the Larson site, i.e. the highest of any known archaeological site in North America.

These general characterizations of Ontario mortality must be tempered by a recognition of the shortcomings of our information. No Ontario site provides an ideal sample for demographic research. Grimsby, Fairty, and Ossossané stand almost alone among the 30 or 40 sites studied as a background to this paper. The three Ontario sites cluster in a separate grouping which is most probably founded on irresolvable adult sample bias. Nevertheless, when Huron and Neutral sites are put in a wider context and when special techniques are used in order to circumvent the insoluble problems that face palaeodemographers, we can begin to make sense of Ontario mortality patterns and discern the trends.

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TABLE 1
The Sites

Sites	Source	Period & Date	Total n excavated	Total used for life table	% infants	% >50 yrs
Fairty	Anderson (1961)	AD 1300-1350	n/a	512.0	5.3	0.0
	Melbye (1981)					10.0
	Kapches (1981)					
Garland	Webb (1969)	ca. AD 1525	n/a	198.0	?	?
Glen Williams	Hartney (1978)	AD 1400-1500	309 ?	283.0	2.5	?
Grimsby	Jackes (n.d.)	AD 1620-1650	373	346.0	3.5	2.6
Kleinburg	Pfeiffer (1974)	ca. AD 1600	?	561.0	—	0.0
Maurice	Jerkic (1975)	AD 1640 ?	n/a	132.0	?	?
Milton	Hartney (1978)	AD 1600-1620	109	—	−4.5	?
Orchid	Cybulski (1966)	AD 1500 ?	369	243.0	<1.0	−4.0
	Hartney (1978)					
Ossossané	Katzenberg & White (1979)	AD 1636	n/a	249.0	9.6	9.2
Shaver Hill	Stothers (1971)	ca. AD 1615	n/a	195.0	?	?
Tabor Hill	Churcher & Kenyon (1960)	ca. AD 1250-1300	n/a	213.0	?	?
	Kapches (1981)					
Uxbridge	Pfeiffer (1983)	ca. AD 1500	n/a	456.5	?	6.7

TABLE 2
Summary statistics based on mean values for Mortality Groups; standardized tables with adult age category set at 25-65

Site	% 10-20	e^0	$\frac{5\text{-}14}{20+}$	$\frac{1}{e^0}$	$\frac{0\text{-}5}{0\text{-}20}$	% >25
Group-A						
minimum q_0 .274	15.73	23.6	.307	42.4	53.5	39.5
maximum q_0 .311	14.92	22.5	.307	44.4	57.9	37.5
Group-I						
minimum q_0 .377	9.26	21.6	.306	46.3	67.3	38.6
maximum q_0 .428	8.50	20.0	.306	50.0	71.8	35.2
Arikara q_0 .523	7.09	17.0	.302	58.8	78.5	29.1
Midwest q_0 .330	9.93	23.1	.309	43.3	62.9	41.8
Group-L						
minimum q_0 .215	9.75	29.5	.159	33.9	58.8	57.1
maximum q_0 .277	8.98	27.4	.159	36.5	66.6	52.6

TABLE 3
Cumulative percent of dead by age group

Site	5	10	15	20	25
Kleinburg	12	18	26	28	32
Maurice	10	14	22	28	33
Turner	7	20	23	30	40
Uxbridge	19	25	29	32	45
Pt. of Pines Late	24	28	29	36	46
Glen Williams	20	27	33	38	45
Gibson Klunk	26	30	34	37	41
Pt. of Pines Middle	31	34	35	39	44
Shaver Hill	8	16	30	52	70
Garland	12	24	30	40	60
Grimsby	12	24	32	43	57
Fairty	22	26	36	46	58
Ossossané	22	30	36	47	58
Libben	31	40	47	54	59
Schild LW	29	38	46	54	61
Indian Knoll	32	41	47	51	60
Nanjemoy II	30	36	40	47	52
Dickson (Blakely)	30	35	40	45	53
Nanjemoy I	29	40	45	47	51
Sully	44	51	56	60	65
Leavenworth	46	54	58	63	69
Schild MISS	38	47	54	58	65
Larson	56	64	66	71	75

TABLE 4
Values used in application of Carrier method for non-stationary population estimates

Age		$r=-.01$	$r=+.01$	$r=-.005$	$r=+.005$
0-5	$(1-r)^{2}$	1.02010	0.98010	1.01003	0.99003
5-10	$(1-r)^{7.5}$	1.07748	0.92739	1.03811	0.96310
10-15	$(1-e)^{12.5}$	1.13245	0.88194	1.06433	0.93927
15-20	$(1-r)^{17.5}$	1.19021	0.83872	1.09120	0.91602
20-25	$(1-r)^{22.5}$	1.25092	0.79761	1.11876	0.89335
25-65	$(1-r)^{44.5}$	1.55704	0.63939	1.24850	0.80007

TABLE 5
Tests of differences in age and sex distribution between two phases at Grimsby as defined by Fox and Kenyon (1982)

	Phase			
	IIIA	IIIB		
age under 20	67	62		
males over 20	21	60		
females over 20	26	44	$\chi^2 = 14.44$	P = .0007
age under 20	67	62		
age 20-35	38	62		
age 35+	9	42	$\chi^2 = 18.28$	P = .0001
males 20 - 35	15	39		
females 20 - 25	23	23		
males 35+	6	21		
females 35+	3	21	$\chi^2 = 12.8$	P = .005

TABLE 6
Mean childhood mortality and juvenile/adult ratios for Ontario and Arikara sites

Site	$r = 0$ mean childhood mortality	$r = 0$ ratio	$r = -.01$ $(r = -.005)$ mean childhood mortality	$r = -.01$ $(r = -.005)$ ratio
Arikara				
Larson	.128	.344	.159	.476
Leavenworth	.117	.321	.145	.439
Sully A	.099	.279	—	—
Sully D	.075	.192	—	—
Sully E	.094	.216	—	—
Ontario				
Fairty	.114	.258	(.126)	(.298)
Glen Williams	.085	.214	—	—
Grimsby	.132	.355	.161	.475
Kleinburg	.064	.188	—	—
Maurice	.052	.115	—	—
Orchid	.063	.153	—	—
Ossossané	.120	.286	(.133)	(.308)
Uxbridge	.057	.147	—	—

TABLE 7
Suggesed "correct" $_5e_0$ with the population estimates (P) and life table birth/death rates $(1/e_0)$: the derived $_5e_0$ is compared with the $_1e_0$ originally presented or published.

Site	Ratio	Final Age	Unadjusted $_5q_0$	$_5e_0$	Adjusted $_5q_0$	$_5e_0$	Full Table $_1e_0$ (unadj.)	ΣDx (adj.)	P with time = 10	20	30	$\frac{1}{_5e_0}$
Ossossané	.286	63.8	.275	23.4	.311	22.4	22.75	281.6	632	318		45
$r = -.005$	.308	***	.246	23.4	(.342)	20.8		253	527	265		48
Grimsby	.355	59.7	.121	26.1	.311	21.0	21.4	476	1001	502	336	48
$r = -.01$	.466	***	.150	23.0	(.368)	17.8		394.6	703	353	237	56
Fairty	.258	65.7	.221	25.6	.311	22.9	24.0*	579	1327	665		44
Glen Williams	.214	69.3	.201	29.9	.277	27.3	——	312.6	854	429		37
Uxbridge	.147	76.4	.191	33.0	.277	29.7	25.0	511	1519	761		34
Kleinburg	.188	71.7	.121	35.9	.277	29.9	25.1**	682	2040	1022		33
Maurice	.115	81.1	.076	42.6	.277	33.9	——	169	574	288		29
Orchid	.153	75.6	.059	38.6	.277	30.2	——	314.6	951	477		33

* The life table here is that of Melbye, 1981 which includes an old age adjustment.

** The life table here is that of Pfeiffer, 1974 with infant adjustment removed; $_5e_0$ not $_1e_0$.

*** The final age determines Dx' values, it is not possible to derive a final age and then calculate a life table at $r = -.01$ to accord with a specific ratio.

$P = (\Sigma Dx * {_5e_0} / \text{time}) + 10\%$ of time

The "correct" $_5e_0$ values are derived from the regression of the final age which gives the correct $_5e_0$ on the juvenile/adult ratio of Bocquet-Appel and Masset (1982). The relationship is non-linear: $\log y = 8.2 + (-.05264x)$; $r = -.966$; derived from Coale and Demeny West Levels 1, 2, 10 (1966:2-11), pooled sexes and Charbonneau (1970:194;1975:125). The resulting $_5e_0/_5q_0$ relationship when compared with the United Nations tables (cf. Ascádi and Nemeskéri 1970:47, Fig. 9) gives some idea of the probable infant under representation.

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THE VAN OORDT SITE: A CASE STUDY IN SALVAGE OSTEOLOGY

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Abstract: The Van Oordt site, c.1400 A.D. in southern Ontario, is a cemetery of between 9 and 13 graves. Each apparently contained the skeleton of a dismembered adult male. One of these, analyzed more fully, revealed evidence of extensive trauma and torture. Parts of three projectile points were still embedded in its bones. The cemetery was probably reserved for enemy warriors slain by the prehistoric Neutral inhabitants of the area. Unfortunately, limitations imposed on the investigation prevented the bio-cultural identification of the victims. Their manner of burial, which may have been intended to immobilize their spirits, is probably not a very appropriate model for their reburial.

Résumé: Le site Van Oordt dan le sud de l'Ontario date d'environ 1400 A.D. Il s'agit d'un cimetière contenant entre 9 et 13 tombes. Dans chaque tombe se trouvait, apparemment, le squelette d'un adulte mâle démembré. L'analyse plus détaillée d'un de ces squelettes a révélé des traces considérables de traumatisme et de torture. Des fragments de trois pointes projectiles se trouvaient encore enfoncées dans les os. Ce cimetière était probablement réservé aux guerriers ennemis tués par les habitants préhistoriques Neutre de la région. Malheureusement, les limites imposées à la recherche ont rendu impossible l'identification bio-culturelle des victimes. Elles ont été enterrées de manière, peut-être, à immobiliser leur esprit, mais il ne convient probablement pas les réenterrer de la me facon.

INTRODUCTION

In May of 1982 the authors, with the approval of the Six Nations Band Council, were involved in the reburial of disturbed plough zone human bone at the Van Oordt site (AiHc-20), near Kitchener, Ontario (Fig. 1). The site has been known since 1966, when some boys found human bone around a groundhog burrow on a knoll on the property of William Van Oordt. Waterloo Township Police investigated and recovered the better part of a single burial (Individual no. 10), a fragment of the right innominate of a second person. and a projectile point lacking only the tip. Shortly after, the police returned to the site and in further excavations recovered parts of at least three people. The bones were analyzed at the Attorney-General's Laboratory in Toronto and then given to the University of Waterloo.

Following the police investigation a local collector, Frank Lisso, visited the site and recorded the presence of numerous bone and tooth fragments in the plough zone. He believed that the site was an ossuary. In 1980 Jack Redmond, Ministry Archaeological Conservation Programme Officer for the Kitchener-Waterloo region, investigated the site because the area encompassing it was zoned for industrial use (Redmond 1983). Mr. Redmond discussed the situation with W.A. Fox and contacted the new owner, Major Holdings Limited, who agreed to have the knoll ploughed. The resulting clusters of exposed bone were mapped by the Ontario Ministry of Culture and Recreation (now Citizenship and Culture) in the autumn of 1981 (Fig. 1).

The writers worked on the site on May 3 of the following year. It is now registered as an official cemetery with the provincial Cemeteries Branch and the planning department of the City of Kitchener. Dr. Matthew Hill of the University of Waterloo has kindly provided the writers with the skeletons recovered by the police. The association of these skeleions with the Van Oordt knoll is unequivocal.

In the 1981 examination it was established that the cemetery consisted of single burials. rather than an ossuary. At that time the bone clusters were recorded and assigned grave numbers. The 1982 reburial agreement between the Band Council and the Ministry specified that the bone in the plough zone could be studied as the undisturbed burials were exposed for observation. The latter were to be neither fully excavated nor pedestalled. Essentially then, we were to clear the disturbed plough zone, revealing but not excavating the burial units. Human bone that had been displaced by ploughing could be removed and analyzed briefly in the field, but then had to be reburied on the top of the pit from which it had come (virtually all of the bone could still be assigned to a particular feature through its location and through comparison with those elements remaining in situ). Bones still in their original context could be observed, photographed and mapped if they rested at the base of the plough zone, where they would be revealed when we reached and cleared the top of the undisturbed stratum, but they could not be removed. Those buried beneath the surface of the subsoil remained beyond our reach. The system obviously

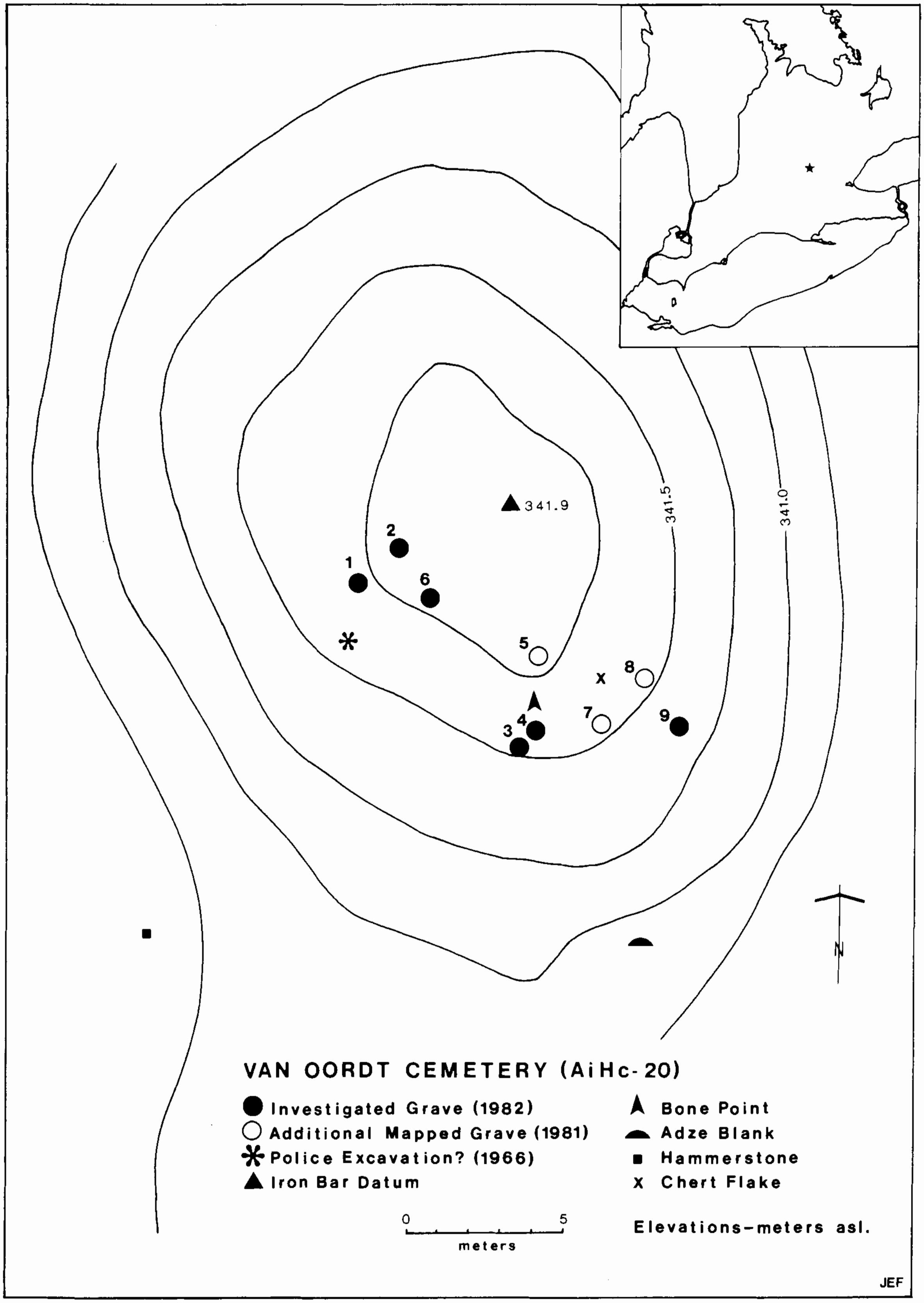


Fig. 1: Van Oordt Cemetery Location.

required close cooperation between archaeologists and osteologists.

The purpose of the field study was thus two-fold: first, to correctly associate the disturbed with the undisturbed bone; and second, to obtain as much archaeo-skeletal information as possible. While acknowledging the constraints upon the latter objective, it is germane to note that little is known about the skeletal biology and archaeology of the Iroquoians of this period and area. Any additional data that could be obtained would be most welcome.

To maximize our information the skeletons from the police investigation, stored at the University of Waterloo, were included in the analysis. Obviously, they could be studied in greater detail than the field burials. However, we did not take possession of the police collection until after the fieldwork had been completed. It proved to offer us a somewhat different perspective on the nature of the site.

THE EVIDENCE

The Excavation:

The Van Oordt cemetery (AiHc-20) is situated on a low sand knoll located on a north-south aligned ridge, just south of a tributary of Strasburg Creek. Strasburg Creek drains eastward to the Grand River in Kitchener, Ontario (Fig. 1), through the rolling kame terrain characteristic of the Waterloo Hills physiographic region (Chapman and Putnam 1973). Site soils are classified as Fox sandy loam (Anonymous 1971). This region was the homeland of a prehistoric Neutral Iroquoian tribe circa 1350-1580 A.D. (Horne n.d.; MacDonald 1983).

During the initial site inspection on November 17, 1981, nine discrete and compact (.25 - 1.0 meter diameter) clusters of human bone were mapped by theodolite in relation to the southeast corner of the field fence line (Fig. 1). A wider scatter of small bone fragments was also mapped, as well as two artifacts – a chert flake and a chlorite schist adze blank fragment. The latter was situated some distance to the south of the human remains and is unlikely to have been associated with the cemetery. The wide scatter of small bone fragments may mark the location of previous police excavation activity.

Further surface survey was accomplished during the subsequent May 3, 1982 visit and two more artifacts were recovered - a bone projectile point and a gabbro cobble hammerstone. The bone point was recovered in close proximity to Graves 3 and 4. Of the nine human bone clusters, six were cleared and in one case (Grave 1) no sub-plough zone pit feature was discovered. Evidently ploughing had totally disturbed this grave. All excavated plough zone soils were 1/4-inch screened for the recovery of bone fragments. Bone clusters 5, 7 and 8 were not

Fig. 2: Grave 6 Exposed.

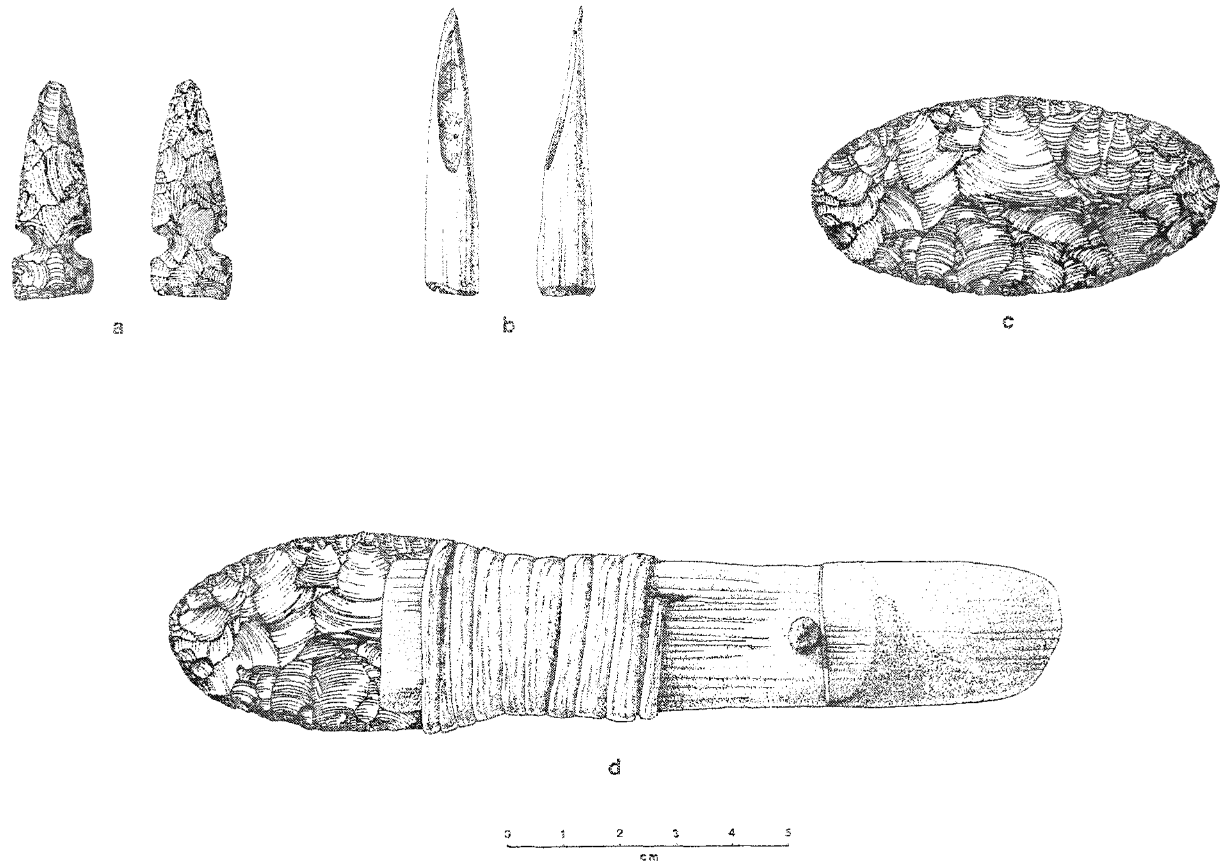


Fig. 3: Van Oordt Artifacts.
a) Chert Nanticoke Notched arrow point; b) Bone arrow point; c) Chert foliate biface knife blade; d) Artist's reconstruction of the foliate biface knife. (Based on a Rochester Museum Specimen.)

cleared: however, osteological analysis suggests that clusters 5 and 8 represent plough-transported segments of graves 4 and 9, respectively.

Once cleared of plough-disturbed topsoil, each of the five grave pit features located were plan-view graphed in relation to a permanent iron-bar-in-concrete datum established just outside the cemetery area in 1982 (Fig. 1). Each grave was also recorded in black and white photos and colour slides (Fig. 2).

All grave features are oval in form, displaying somewhat irregular pit margins which were nevertheless clearly defined (with the exception of Grave 2). Tractor tire disturbance had destroyed the outline of the east half of Grave 9. Pit fills vary from a light to dark grey-brown colour against a red-brown to beige subsoil. The long axis of the grave pits is quite variable, including one aligned NW-SE (grave 4), two aligned N-S (Graves 2 and 9), and two oriented NE-SW (Graves 3 and 6). Graves 3 and 4 situated only 7 centimeters apart, are connected by a pocket of subsoil disturbance containing bone but of a different colour than the adjacent grave fills. These two graves do not appear to overlap. Grave pit dimensions were recorded as follows: Grave 2 - 80 x 59 cm, Grave 3 - 93 x 60 cm, Grave 4 - 53 x 33 cm, Grave 6 - 80 x 65 cm, and Grave 9 - 65 x ? cm (partially destroyed). Finally, the grave pit distribution across the Van Oordt cemetery forms a linear pattern oriented NW-SE (Fig. 1).

Artifacts:

One bone and five chert artifacts appear to be directly associated with the cemetery. Only the Onondaga chert foliate biface knife blade was found "in situ" during the 1982 excavations (Fig. 2, 3c-d). The bone projectile point was surface collected in 1982, while a virtually complete Onondaga chert arrowpoint was recovered during the 1966 police investigation by Constable Stevenson (see Fig. 3a, b). Three chert arrow point tips were found embedded in human bone exhumed during the latter investigation.

The foliate biface knife blade was manufactured by an extremely skillful knapper and measures 69.8, 34.2 and 6.6 mm in maximum length, width and thickness, respectively. Such tools are a characteristic, albeit rare, component of Late Woodland assemblages dating c. 1400-1650 A.D. (Fox 1981a). A particularly well preserved hafted specimen was recovered from an early historic Seneca grave in New York state (Fox 1982), and has been used as a model for the artist's reconstruction of the Van Oordt tool illustrated in Figure 3d. As mentioned, the blade is very skillfully flaked and is unusually thin in comparison to the 8 mm average for this tool type (Fox 1981a:3). The Onondaga chert is a light mottled grey variant typical of western sources in Ontario (Fox n.d.), and was probably obtained from quarries in the Hagersville/Nanticoke

Creek vicinity 60 km southeast of the cemetery (Hamalainen 1977; Jamieson 1978).

The blade's association with a partially articulated individual in Grave 6 was suggestive, so the artifact was retained unwashed for residue analysis. Mr. Thomas Loy, Associate Curator in the Archaeology Division of the British Columbia Provincial Museum, kindly conducted the analysis, obtaining a positive reaction for the presence of human immunoglobin G (IgG gamma chain). This is positive evidence for the presence of human blood on the Van Oordt knife blade (T. Loy, pers. comm., letter dated January 10, 1985). In addition, a small plaque of blood was identified near one end of the biface, while some copper-stained resin was noted on one face near the opposite end. It is hypothesized that the latter deposit relates to a green-coloured hafting compound. The knife was thus probably used to dismember the individual in Grave 6, and possibly all the other dismembered persons in the cemetery. Its extremely refined, form and inclusion in the grave certainly suggest a more than utilitarian function for, and perception of, this tool.

The carefully worked bone projectile point is of an unusual hollow form, probably manufactured from a raccoon femur (R. Prevec, pers. comm.). While conical antler tine points are not uncommon in Ontario, most bone projectile points are manufactured on flat slabs of dense bone. Measuring 50.5 x 9.4 x 11.O mm in maximum length, width and thickness respectively, the Van Oordt specimen's aperture indicates a minimum arrow shaft diameter of 5.8 mm (Fig. 3b). Mr. Loy has identified human blood on the point.

A Nanticoke Notched style (Fox 1981b) chert arrowpoint was made available for study by Mr. Stevenson of Kitchener. It is of typical late prehistoric Neutral form, manufactured of Onondaga chert from a source similar to that of the Grave 6 knife blade. Approximately 2 mm of the tip is missing due to an oblique snap fracture, while the remainder measures 38.5 mm in maximum length (Fig. 3a). Maximum width is 14.5 mm, maximum thickness is 4 mm and inter-notch width is 7 mm.

Exposed Skeletons:

Sex estimates of the skeletal material examined in the field involved "educated" judgements of the robusticity of the crania (supraorbital ridges, facial tubercles, mastoids, nuchal regions) and long bones (articular surfaces and muscle markings). No pubic bones were accessible for sex identification. Age was assessed using the following criteria: dental eruption, dental attrition, spheno-occipital synchondrosal fusion, and long bone epiphyseal fusion. Dental pathology, particularly attrition, was used to delimit adult age more precisely.

Only non-metric morphogenetic variants (see Anderson 1963; Molto 1983; Saunders 1978a) were recorded since few bones were measurable. Several of the fragmentary bones and all of the revealed burial features were photographed. These photographs proved invaluable for reconstructing mortuary data. Perhaps the most valuable methodological procedure was having two skeletal biologists at the site. This undoubtedly increased the accuracy and precision of observations, particularly with problematic specimens.

In sexing and aging the police collection skeletons, which could be analyzed in the laboratory, the above criteria plus standard pelvic observations were used (see Ubelaker 1978). Also, a large battery of non-metric traits plus some morphometric data were recorded. Pathological conditions were examined after reconstruction of the two most complete individuals. A hand glass and microscope were used to examine bones for cut marks and traumatic injuries.

Nine features were tentatively identified in the field in 1981. Most of these were then exposed in the 1982 plough zone excavations. All are summarized in Table 1 (see also Fig. 2). Each of the exposed graves apparently contained

TABLE 1
Field Burials

Burials	Sex	Age	Remarks
1	male	young adult (25-30 yrs)	cut marks on neck of R. femur; L elbow still articulated
2	male	young adult (18-25 yrs)	both legs severed at hip but intact at knee; R leg intact at foot
3	unknown	young adult (18-25 yrs)	no data on dismemberment
4	male	adult	no data on dismemberment
5	unknown	young adult (early 20's)	no data on dismemberment; possibly just plough-transported material from Grave 4
6	male	young adult (25-35 yrs)	beheaded; shoulder and pelvic girdles removed; L arm severed at shoulder but intact at elbow; L leg severed at knee
7	unknown	unknown	not investigated
8	male	adult	no data on dismemberment; possibly just plough-transported material from Grave 9
9	male	young adult (20's)	L leg severed at hip

a single individual. Note that when sex could be assessed, all were males. Also, all were young adults, ranging in age from the early twenties to the mid-thirties. In each case where the question could be addressed, the interment was primary but with disarticulated elements.

Excavation conditions produced varying amounts of data, with some, like Grave 4, yielding virtually nothing and others, such as Grave 9, producing considerable morphological and mortuary information. There is an inverse relationship, determined by the degree of postmortem disturbance, between the morphological and mortuary data. The former generally increases with the amount of plough zone disturbance, since the fragments could be removed and analyzed. On the other hand, undisturbed bone preserved the integrity of the burial position but could not be examined for morphological detail. The non-metric morphological data from the field and police material are presented in Table 2, and the observations on the dental pathology are summarized in Table 3. The data are presented in more detail in Molto, Spence and Fox (1984) and Spence (1984).

Grave 6, one of the more productive features with respect to mortuary data, will be discussed more fully as an example of the sort of information obtained in the field (Fig. 2). Although the uppermost bones had been struck and displaced somewhat by the plough, a number of observations were still possible. An articulated vertebral column with ribs, complete to the third lumbar, rested ventral side down while the fourth and fifth lumbars, sacrum, and left innominate formed an articulated unit (the right innominate had been displaced by the plough) some distance to the north of L3. Apparently, then, the body of no. 6 had been severed at the L3-L4 articulation. The displacement of the cranium well to the east of its normal articulated position indicates beheading. Both scapulae had been detached, and the left arm can be observed, still articulated at the elbow, lying at the right side of the torso. A close examination of the exposed segments of the burial thus shows that individual no. 6 had been extensively dismembered. The head had been removed and both the pelvic and shoulder girdles had been detached from the torso. The left arm had then been further detached from the shoulder girdle, though it was left intact at the elbow. The left leg had been severed at the knee, but plough disturbance precluded any further observations on the lower limbs. It should be noted that much of this description derives from later study of the notes, burial plan, and photo, stimulated by our findings on the police collection material; rather than from observations actually made in the field.

The Police Collection:

The police collection contained four individuals, at least two of whom were complete enough to ensure that they were distinct from the numbered field burials. For only one of these, no. 10, could cranial and infracranial elements be associated. Of the other individuals, one (no. 11-1) was somewhat complete while the other two were poorly represented and, as noted, could well be exhumed segments of field burials. All four are adults, two definitely young adults and two of unspecified age. Three are males and one is of unknown sex.

TABLE 2
Non-metric Traits

Trait	By Side	By Individual
bregmatic ossicle		0/1
metopic suture		0/5
frontal grooves	2/2	1/1
supraorbital foramen	7/8	5/5
accessory ethmoid foramen	1/2	1/1
trochlear spur	0/3	0/2
accessory optic canal	0/2	0/1
os japonicum	0/4	0/3
zygomatico-facial foramen	4/7	3/5
infraorbital suture	2/2	1/1
accessory infraorbital foramen	0/2	0/1
maxillary torus		0/1
palatine torus		0/1
clino-clinoid bridge	0/2	0/1
carotico-clinoid spur	1/2	1/1
lateral pterygoid plate foramen	0/2	0/1
Vesalian foramen	1/2	1/1
pterygo-spinous spur	0/2	0/2
pterygo-basal spur	0/2	0/2
spino-basal spur	1/3	1/3
ovale-spinosum confluent	0/4	0/3
open foramen spinosum	0/2	0/1
pterionic ossicle	0/2	0/1
parietal process of temporal	0/2	0/2
tympanic dehiscence	0/4	0/3
marginal foramen	0/4	0/3
divided mastoid	2/4	2/3
mastoid foramen	1/1	1/1
mendosal suture		0/4
ossified apical ligament		0/1
precondylar tubercle	0/2	0/1
pharyngeal fossa		0/1
discrete occipital condyle	0/1	0/1
posterior condylar canal	0/1	0/1
intermediate condylar canal	1/1	1/1
divided hypoglossal canal	0/5	0/4
protostylid	0/2*	0/1
Carabelli's trait	1/6*	1/3
mandibular torus	0/2	0/1
mylohyoid arch	0/3	0/2
accessory mental foramen	0/3	0/2
atlas retroarticular bridge	1/7	1/4
atlas lateral bridge	0/7	0/4
atlas posterior bridge/spur	3/7	2/4
C6, foramen transversarium divided/spurred	4/4	2/2
T9, rib facet on transverse process absent	2/3	2/2
T10, rib facet on transverse process absent	2/3	2/2
L1, rib facets	2/5	1/3
L1, transverse process absent	2/5	1/3
spondylolysis		0/3
sternal foramen		0/2
suprascapular foramen	0/4	0/2
unfused acromion epiphysis	0/2	0/1
supratrochlear spur	0/4	0/2
septal aperture	1/9	1/5
discrete ulna trochlear notch facets	1/3	1/2
ulna distal tuberosity	0/3	0/2
accessory facets on sacrum	0/3	0/2
acetabular mark	4/5	2/3
third trochanter	5/6	4/4
fossa of Allen	2/4	1/2
vastus notch	1/4	1/3
bipartite patella	2/4	1/3
os trigonum	0/2	0/1
discrete talar neck facet	0/3	0/2
discrete anterior and middle superior facets of calcaneus	4/4	3/3
peroneal tubercle	2/3	1/2

* — by molar

In contrast to the field burials we have virtually no contextual information on the police material. but with the luxury of laboratory analysis these burials yielded substantial data on morphology, pathology and trauma. Dismemberment was evident on three of these people, and unhealed traumatic injuries on at least one. Individual no. 10, the most complete of the Van Oordt skeletons, was particularly informative and so will be described below in some detail.

Individual no. 10 is a young adult male, about 20-24 years by the McKern and Stewart criteria (1957). The only missing elements are the fourth and fifth cervical vertebrae, a couple of ribs, the left ulna and radius, part of the shaft of the left humerus, most of the left hand, the left patella. the right navicular, and several hand and foot phalanges. There is clear evidence of extensive trauma and dismemberment. The traumatic injuries are the result of assault by perhaps as many as three individuals (parts of three projectile points were recovered). Seven stab wounds have been identified.

A puncture wound was left on the posterior surface of the glenoid fossa of the left scapula by a missile that had entered horizontally from Individual 10's right, creating a slash along the superior surface of the base of the left acromion. Microscopic examination of the puncture disclosed the presence of minute flakes of Onondaga chert embedded in the bone. One of the larger flakes (3 mm in maximum dimension) was extracted and was found subsequently to articulate exactly with the tip of the Stevenson arrowpoint which was recovered in association with the remains of Individual 10 (Police report of August 25, 1966 burial investigation). Another blow, entering the left shoulder from the rear, left an Onondaga chert biface arrowpoint tip lodged in the posterior surface of the left humerus head, of Individual 10. It displays a double transverse snap fracture pattern as a result of penetration (Fig. 4a), and measures 16.8 x 9.0 x 3.2 mm in maximum length, width, and thickness. The seventh thoracic vertebra body of Individual 10 contained a Bois Blanc formation (Haldimand variant?) chert biface arrowpoint tip fragment from a missile that had entered from the left side at a slight downward angle. Its extremity is missing, but the remainder measures 10.8 x 8.4 x 3.4 mm in length, width, and thickness (Fig. 4b). We were unable to locate

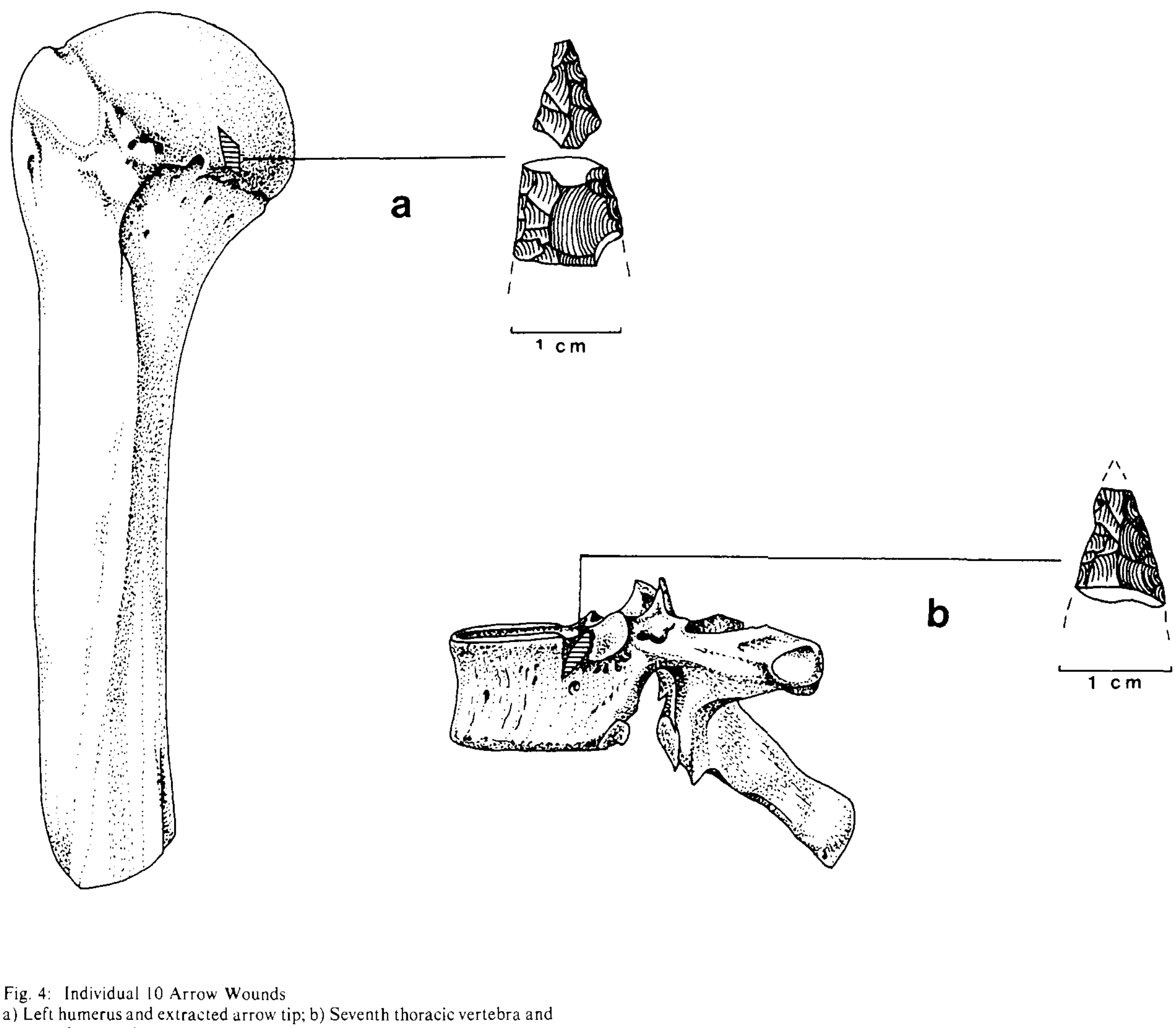


Fig. 4: Individual 10 Arrow Wounds
a) Left humerus and extracted arrow tip; b) Seventh thoracic vertebra and extracted arrow tip.

Fig. 5: Cut Marks, Individual 10.
Dashed lines indicate posterior views, solid lines indicate anterior views.
Bones recovered for analysis are indicated by stippling.

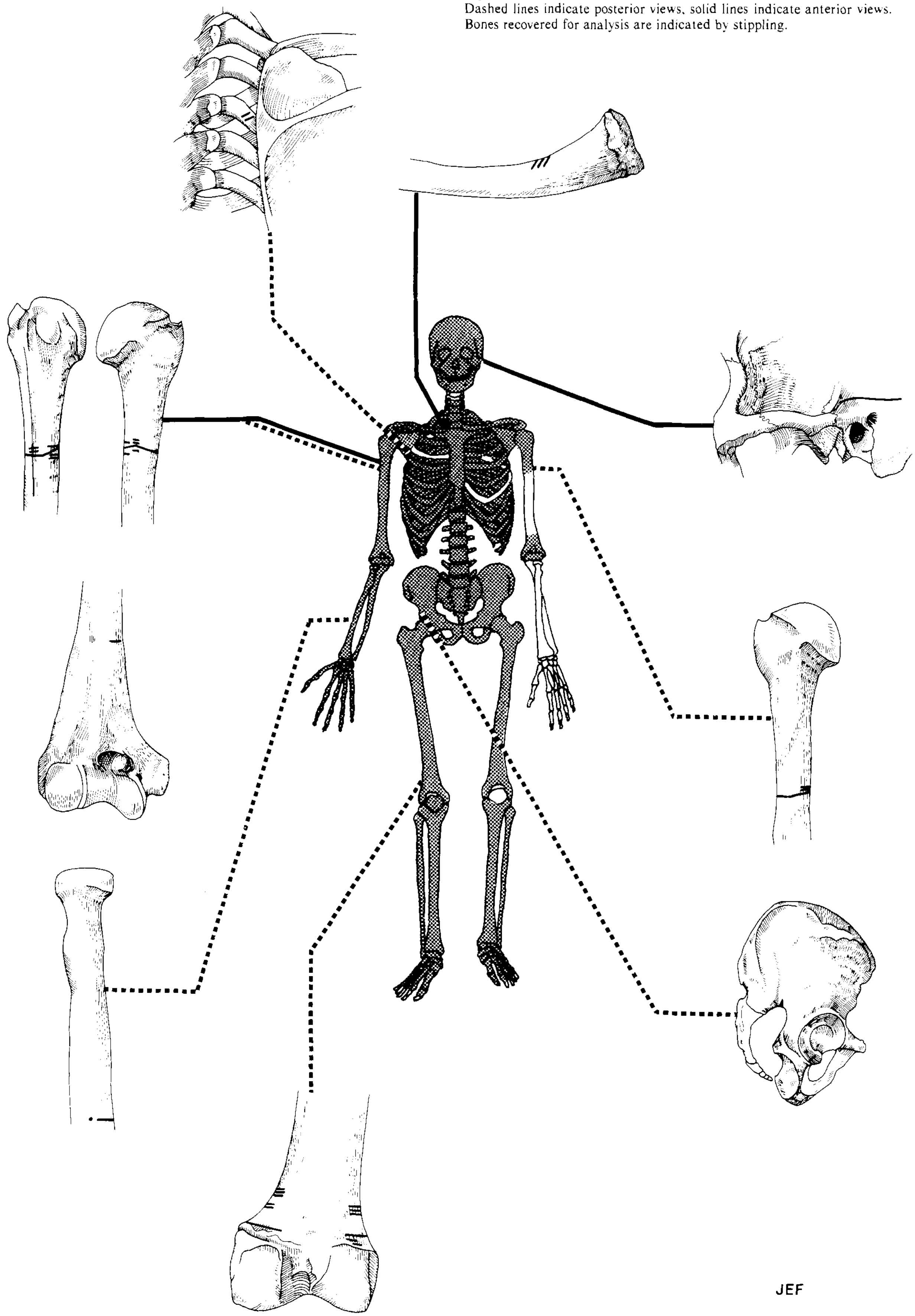
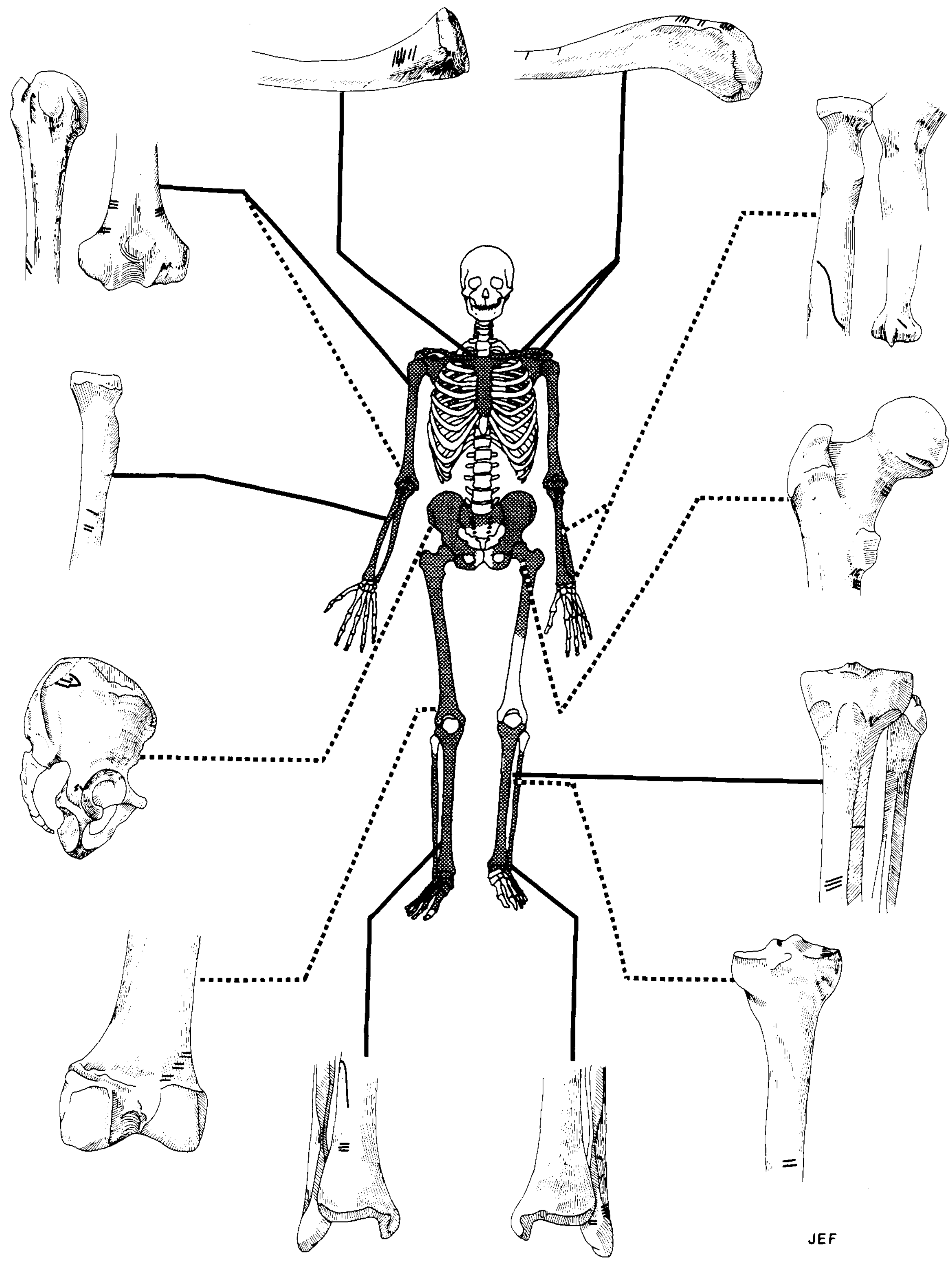


Fig. 6: Cut Marks, Individual 11-1.
Dashed lined indicate posterior views, solid lines indicate anterior views.
Bones recovered for analysis are indicated by stippling.



the extremity fragment elsewhere in Individual 10. Both Onondaga and Bois Blanc formation cherts are available in the Hagersville vicinity to the southeast.

A puncture wound was left in the left transverse process of the sixth thoracic vertebra of Individual 10 by a missile that had been fired into the victim from his left front, angling slightly upward. The wound measures 10.8 mm in length, 8.4 mm in width, and 3.4 mm in depth, terminating in a flat, rather than pointed, form. Such a truncated penetration scar could be caused by an arrowpoint minus tip extremity and, indeed, the wound's size correlates very well with what would have been the truncated arrow that had been shot into the humerus. It does not agree in morphology with the Stevenson point tip or the Bois Blanc formation chert arrowpoint which penetrated the seventh thoracic vertebra of Individual 10. Apparently, then, the missile fired into the left shoulder from the rear had been withdrawn and subsequently shot into the body from the left front, perhaps as the victim was lying on the ground.

In addition, a shallow puncture located only 3 mm anterior to the wound in the sixth thoracic indicates still another, perhaps less powerful, strike. Another blow, delivered from the rear, damaged the left inferior articular facet of the ninth thoracic and the corresponding superior articular facet of the tenth. Finally, there is a puncture and associated short slash at mid-point on the posterior surface of the right radius.

Both of the upper arms of Individual 10 were severed. This was probably done as part of his torture and execution, rather than as post-mortem dismemberment. since the arms were severed at mid-shaft instead of at the joints. The flesh and muscles of the upper arms were cut through to reveal the humeri, which were then snapped (Fig. 5). There are 25 cut marks clustered around the break on the anterior and medial surfaces of the right humerus. On the left humerus two cut marks were noted proximal to the break, but the segment of the shaft immediately distal to the break is missing from the police collection.

The other cut marks on no. 10 probably reflect post-mortem dismemberment. These are summarized in Table 4, and are represented schematically in Figure 5. Keeping in mind that some elements may have been detached or severed without leaving visible cuts on the bone (Finlayson 1977:272), it appears that, minimally, no. 10 was beheaded and had the right part of the shoulder girdle removed (note rib and clavicle cuts), the right arm severed at the elbow, and the right leg detached at the hip and severed at the knee.

Of the three individuals represented in the category 11 bone, two are drastically underrepresented but several postcranial elements of the third, a young adult male desig nated 11-1, could be reassembled. Only one cut, a long curving slash on the central part of the posterior surface of the left radius (Fig. 6), suggests conflict or torture. The other cut marks, listed in Table 4 and schematically illustrated in Figure 6, are probably all due to dismemberment. The left arm was apparently severed at the shoulder and the wrist, while the right arm was cut at the shoulder (possibly with the detachment of the right half of the shoulder girdle) and the elbow. Both legs were detached at the hip and severed at the knee and ankle.

The other category 11 bone cannot be sorted into individuals. There are two people represented beyond Individual 11-1. Both are adults, and one can be identified as a male. At least one of these bears dismemberment cuts. Isolated instances of dismemberment in this undifferentiated group of bones include beheading (cut marks on an occipital fragment and a third cervical vertebra, not necessarily of the same person), removal of elements of the shoulder girdle (cuts on several left and right ribs, a left clavicle, and perhaps a left scapula), and detachment of a right leg at the hip (cuts on a right ischium). There are no definite combat wounds, though a single cut along the inferior base of a left acromion may have been due to conflict or torture.

The skeletal evidence summarized:

In sum, there are probably between 9 and 13 individuals represented in the cemetery. Where adequate evidence was available, it could be determined that these were young adult males who had been extensively dismembered. Legs and arms were usually detached from the torso, in some cases by removing the shoulder and pelvic girdles. Beheading appears to have been common. Limbs were less frequently severed at elbow, knee, wrist and ankle. The dismemberment was not rigidly patterned. Joints severed on one individual might be left intact on another, and in some cases a joint severed on an individual's right side would remain untouched on his left. The technique used to dismember even a single individual varied. For example, both legs of no. 11-1 were detached at the hip, but the cut marks on the left side are concentrated on the proximal part of the femur while those on the right are on the innominate. The reasons for these somewhat unsystematic procedures are not clear. They may reflect the involvement of several different people, a certain haste or inexperience, or simply a flexible and pragmatic approach to the task.

The evidence of conflict-related trauma is clear for no. 10, the most complete of the police collection skeletons. Two other possible cases of injuries inflicted during combat or torture are represented by the isolated slashes on the left radius of no. 11-1 and the left scapula of another category 11 individual. No traces of cannibalism (burned or shattered bone, longitudinal striae on long bone shafts, etc.) were noted on the police collection material.

DISCUSSION

Between 9 and 13 single burials make up the Van Oordt collection. The site was fully delimited, so the sample is indeed an archaeological entity rather than a biased portion of a larger cemetery. Archaeologically, Van Oordt dates to c. 1400 A.D. (see below). This seriation is supported by the dental pathology (Table 3) which, with its moderate rate of caries, early onset of antemortem tooth loss (see burials 6 and 10), and lack of antemortem fracturing, is suggestive of the horticultural diet of the Iroquoians at this stage in the Late Woodland sequence (see Patterson 1984). The incidence of caries (9/59 - 15.3%) is low relative to data reported for Woodland samples at this time (Patterson 1984:313). However, this discrepancy be-

TABLE 3
Summary of Van Oordt Dental Pathology

Burial Number	Area	No. of Teeth	I_1	I_2	C	P_1	P_2	M_1	M_2	M_3	Carious Teeth	Antemortem Trauma	Tartar	Periapical Abscess	Peridontal Resorption	Antemortem Tooth Loss
1	max.	9	2	1	1	1	–	2	1	1	3 (both I_1's,PM_1)	Absent	Moderate	1(PM_1)	Slight	None
2	max.	11	–	1	2	2	2	2	2	–	1(M_2)	Absent	Absent	Absent	Absent	None
	max.	6	–	1	1	1	1	1	1	–	0	Absent	Absent	Absent	Absent	None
3	max.	5	–	–	1	1	1	1	1	–	0	Absent	Absent	Absent	Absent	—
5	max.	10	0	2	2	2	2	–	2	–	0	Absent	Absent	Absent	Slight	None
	man.	7	2	2	1	–	–	–	2	–	1(M_2)	Absent	Absent	Absent	Slight	None
6	max.	–	–	–	–	–	–	–	–	–	–	–	–	–	Severe	5(P_1–M_3)*
	man.	1	–	–	–	1	–	–	–	–	0	–	–	1(PM_1)	–	—
8	max.	2	–	–	–	–	–	–	1	1	0	Absent	Absent	Absent	Absent	None
9	max.	2	–	–	–	–	–	1	1	–	0	Absent	Absent	Absent	Absent	—
10	max.	6	–	1	2	–	1	1	1	–	4(I_2, C, P_2[2], M_2)	Absent	Absent	3(both I_1's, M_1)	Slight to Moderate	5/16(both I_1's,I_2, P_2, M_3)

Caries Rate - 9/59

* probably due to caries

comes less significant when the pattern of carious activity is examined more closely. First, several of the carious lesions are extensive and there is little doubt that caries is the principal etiological, agent in antemortem tooth loss. Second, the caries at Van Oordt equally involve the anterior and posterior teeth which, along with their extensive nature, suggests that the diet had a substantial carbohydrate content and was refined enough to facilitate impaction of the food between the anterior teeth. A third and more pragmatic factor concerns the limitations of the study sample (only young adults, fragmented and incomplete material, lack of cleaning, limited study time, and the lack of x-rays for analysis), limitations which unquestionably contributed to the comparatively low rate recorded. The dental and archaeological data are therefore more congruent than the crude caries rate indicates.

While we believe this seriation is reasonably accurate, the cemetery does present a number of unusual features relative to the better known mortuary complexes of the Glen Meyer and Historic Neutral cultures. First, it is removed from any known habitation site. Second, the individuals were interred in separate, disjunct pits. Third, the demographic profile is biased in that all identifiable individuals were young adult males. And fourth, the arrangement of bones in the graves, as well as the condition of the extant material, indicate that the burials were primary but dismembered. It might be argued that some were secondary, partially but not totally decomposed, but there is no clear evidence of this. On the contrary, for all individuals for whom we have adequate data, dismemberment rather than decomposition was the process behind the observed disarticulations.

The site, then, seems to have been a specialized cemetery. It may have been reserved for all young adult males, but the absence of any other such sites in southwestern Ontario makes this unlikely. More probably it was for a subset of that group: those who had died violently. Analogy to the Historic period Huron carries some risk – it involves projecting beliefs and customs back some 200 years – but it is worth noting that the souls of those who died violently were believed by the Huron to be dangerous, and were excluded from the villages of the dead by not exhuming the bodies from their primary burial places for the Feast of the Dead (Trigger 1969:104; 1976:75). Although only two Van Oordt individuals could be adequately examined for evidence of conflict, the case for Individual 10 is overwhelming. The cut on the left radius of no. 11-1 may also be due to conflict or torture, but this is more debatable. The distance of the cemetery from the community may have been a response to the fear of spirits. The general dismemberment might have been still another measure designed to protect the living, in this case by immobilizing the spirits of the dead. Though there is no statement to that effect in the ethnohistoric record, the bodies of the captives tortured and killed by the Huron were generally dismembered (Trigger 1976:74). This might have been in part for cannibalistic purposes, but at Van Oordt there is no evidence of cannibalism.

The suggestion that Van Oordt is a cemetery restricted to those who died violently raises further questions. For one, who committed these acts? The site is isolated from local prehistoric Neutral villages. The two closest, Moyer (Wagner et al. 1973) and Reidel Road (Redmond 1983), date to c. 1400 A.D. Few comparative artifacts are available from the nearby (1.75 km) Reidel Road village. However, an extensive artifact assemblage was recovered during the 1970-72 Wilfrid Laurier University excavations on the Moyer village, situated a mere 1.9 km to

TABLE 4
Distribution of Dismemberment Cut Marks

Element	No. 10	No. 11-1
cranium	1 above L mastoid process	no data
cervicals	none	no data
ribs	5 externally on R fourth rib	no data
R scapula	none	none (part missing)
L scapula	none	none (part missing)
R clavicle	15 medially on antero-superior edge	18 medially on antero-superior edge
L clavicle	none	17 laterally on posterior edge
R humerus	1 on anterior surface near distal epiphysis	5 on lateral shaft near proximal epiphysis; 17 on posterior-surface just above distal epiphysis
L humerus	none	none distally (proximal part missing)
R radius	none	3 laterally, shortly below radial tuberosity
L radius	missing	none
R ulna	none	none
L ulna	missing	1 posteriorally at distal epiphysis
R innominate	1 (deep sawing) on superior margin of sciatic notch	8 externally, 5 near iliac crest and 3 posterior to acetabulum
L innominate	none	none
R femur	23 posteriorly, above distal condyle	10 posteriorly, above distal condyle
L femur	none	15 medially, 5 on neck and 10 slightly further down shaft (distal half missing)
R tibia	none	4 anteriorly, on distal part of shaft
L tibia	none	5 on medial and posterior surfaces shortly above mid-shaft, 1 higher on lateral surface
R fibula	none	none
L fibula	none	10 by distal epiphysis

the southwest of the Van Oordt cemetery. A series of seven hollow bone projectile points, most identical to the Van Oordt specimen, were recovered (Wagner et al. 1973:97), while the Stevenson projectile point fits well within the Moyer Onondaga chert side-notched point collection (n - 22) on the basis of both metric and non-metric morphological attributes. In addition, the Moyer village excavations produced an Onondaga chert foliate biface and one of the very few Haldimand chert arrowpoints recovered from a Middleport or Late Prehistoric Neutral village. Although these data are extremely suggestive. future excavation of the Reidel Road village could produce an equally similar tool assemblage. Nevertheless, there is little doubt that the Van Oordt cemetery population reflects an as yet incompletely documented example of aggressive behaviour and possible ritual treatment at the hands of the local prehistoric Neutral people.

Two scenarios then emerge. First, Individual 10 may have been a local native killed in a quarrel or feud. How ever, the evidence of torture argues against this. Second, the Van Oordt cemetery may have been reserved for enemy warriors. Its distance from the village and the prevalence of dismemberment support this interpretation. It may represent a single event in which a number of enemies were killed in battle or executed, or it may represent a series of such events. In either case there was a concerted effort to keep the interments separate from one another.

Given the paucity of morphological data (Table 2), it is impossible to address the question of the biological affinities of those interred in the Van Oordt cemetery. The dental pattern of the site, and the distribution of Iroquoian groups in southern Ontario at that time, suggest that they were probably Iroquoian. However, which particular group or groups they represent is a mystery that can only be settled by a more complete excavation of the site and by comparison with contemporaneous series in and beyond the area.

CONCLUSIONS

The Van Oordt burials, in our opinion, represent Iroquoians of unknown affinity who died in or as a sequel to combat. At least one individual was tortured. Their slayers may well have been the Neutrals from the Moyer site. However, the constraints of the fieldwork make our interpretations highly speculative. While the research compromise for the analysis and reburial of the Van Oordt skeletons might be considered reasonable under the circumstances, this compromise has left us with an imperfect understanding of the site. In fact, if it were not for the police burials housed at the University of Waterloo it is quite likely that the unique nature of the site would have been overlooked, despite some clues salvaged in the field analysis. One is reminded here of the importance of *in situ* analysis of burials (Saunders 1978b). More seriously, the compromise may have resulted in an improper reburial, one that has simply perpetuated a burial mode that would have been considered most unsatisfactory by those in the cemetery. If our interpretations hold true, the original mode of interment was designed to immobilize or restrain the spirits of the dead. The proper way to redress this situation would ideally be to identify their actual cultural affiliations and then to rebury them in their home area in a manner befitting young adult males of their society. As noted above, this would require a full excavation of the site, a careful analysis to determine whether it was indeed a special cemetery, and a comparative study to identify their bio-cultural affiliations.

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A FIRST GLANCE AT THE BIOCULTURAL ADAPTATION OF SOME PREHISTORIC ST. LAWRENCE IROQUOIANS[1]

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Abstract: Up to now, very few skeletal remains assignable to prehistoric or protohistoric Iroquoians have been dug up in Quebec. The main reason is that before 1970 or so, professional archaeology was practically unknown in Quebec. In any case, human remains are probably scanty since the St. Lawrence Valley was thinly populated in comparison with Huronia, for example.

Despite the late development of archaeology in Quebec, one has already reason to question largely accepted hypotheses regarding the biological and cultural identity of the inhabitants of the St. Lawrence Valley. Research carried out in that part of Iroquoia that remained largely unknown until 15 years ago has led Quebec archaeologists to argue that the St. Lawrence Iroquoians were made up of more or less distinct groups who have experienced an *in situ* development much more ancient than was thought before.

In a quite similar manner, the biological picture of the Laurentian Iroquoians has also been challenged. On the basis of a comparative analysis, whose scope is yet limited by the poverty of the samples, it has been tentatively suggested that some groups of St. Lawrence Iroquoians were quite different from one another and from Ontario Iroquoians.

My research essentially bears on these two issues, that is, the biological variability among the Laurentian Iroquoians and their biological relationship with their neighbours of Southeastern Ontario. The few existing collections of Quebec Iroquoians have all been previously studied, but usually succinctly and individually. This study is thus the first to compare these samples. Needless to say that it is primarily exploratory. Nevertheless, I have tentatively derived, from the intra- and inter-regional diversity, an adaptive network of interactions between biology, culture and physical environment.

Only crania have been examined. Those from Quebec come mainly from four samples: Dawson and Westmount (on Montreal Island), Mandeville (at the mouth of the Richelieu River) and Place Royale (in Quebec City). Ontario collections are those from the Syers ossuary (Durham County) and Keffer ossuary (York County). Given the exploratory character of this research, I chose to diversify the observations: craniofacial measurements, epigenetic and dental traits. Statistical analysis is limited by the small size of Quebec samples. It is therefore obvious that our appreciation and interpretation of variability is based upon a good deal of intuition.

The sample from the Dawson site, which is considered to be Hochelaga visited by Cartier in 1535, is surprisingly variable in shape and size. The males have, on the average, a large cranial capacity, and some do not conform to the "Iroquoian type" of skull. In comparison, the males of Mandeville are much more homogeneous. They show gentle outlines and none is robust. On the contrary, males found in Westmount have a robust appearance and an angular profile. The attributes that stand out in the material of Place Royale concern the masticatory apparatus: robust mandibles, low percentages of caries and *ante mortem* tooth loss, and a uniform tooth wear.

The comparison between the Syers and Keffer samples have yielded few differences, among which two are particularly noticeable: the males of Syers are more heterogeneous and the frequency of dental caries is three times higher.

Given these results, the comparison between the pooled sample of Quebec collections and that of Ontario collections yields somewhat expected results. Most of the craniofacial dimensions are, on the average, greater among Quebec males, and Ontario males are more heterogeneous. No trend has been detected in the female samples. On the other hand, the males are, in comparison with the females, more variable in Ontario than they are in Quebec.

Regarding the non-metric traits, one observation deserves special attention: the frequency of tooth caries is much higher among Ontario individuals. The frequencies of five discrete traits are significantly different as well.

If we accept that the biological differences of the samples can be generalized to the groups they represent, how can we explain them? At the Dawson site, all seems to happen as if interbreeding had taken place, or as if some foreigners had been incorporated into the local community. It is likely that the site of the Island of Montreal, at the cross-roads of major waterways, has promoted the cultural and biological blending of distinct groups. We have certain reason to believe that certain individuals might have close affinities with Algonquian people.

It appears that things have been quite different at the Mandeville village. Indeed, this homogeneous sample is more consistent with a group whose network of genetic exchanges was quite limited. Moreover, on the basis of other sources of data, this village seems to have been relatively isolated from the other permanent settlements of the St. Lawrence Valley.

The dental attributes of the people of Place Royale are indicative of a diet in which the products of hunting, fishing and gathering activities occupied an important place, while the dentition of the other samples reflects a more agriculture-oriented food consumption.

It is suggested that these differences between the Quebec samples are the result of the differentiating action of the physical environment which would have generated, all along the St. Lawrence Valley, various adaptive behaviours and ultimately fostered a biological and cultural fragmentation of its inhabitants into more or less distinct subgroups.

It is likely that the physical environment also played an important role in creating the disparity between Ontario and Quebec Iroquoians. Because of the abundance of natural resources in the St. Lawrence Valley and the harsh climate unfavorable to the development of agriculture, Laurentian Iroquoians might have adopted the practice of agriculture and social customs presumably associated with it later than their Ontario neighbours. Thus, it is proposed that the greater variability of males with regard to the females that we have observed among Ontario Iroquoians, attests that uxorilocality was more prevalent in Ontario than it was in Quebec.

In conclusion, despite the paucity of skeletal remains, I tentatively assert that the Iroquoians were not as homogeneous as was previously believed. The addition of Quebec samples has increased the representation of the Laurentian Iroquoians and is therefore a major contribution to that issue. This high degree of variability among Iroquoians should be kept in mind by anyone who wishes to have an overall view of Iroquoian prehistory. Our disagreement with other prehistorians is probably not a fundamental one; we believe it is only one of degree.

Résumé: La présente étude est basée sur l'examen de quatre collections de crâne d'Iroquoiens préhistoriques du Québec. L'analyse de caractères craniométriques, épigénétiques et odontologiques suggère que les Iroquoiens du Saint-Laurent étaient composés de sous-groupes biologiquement distincts. La diversité de l'environnement physique le long du Saint-Laurent serait à l'origine de cette diversité biologique.

D'autre part, l'analyse comparative des collections québécoises et de deux collections d'Iroquoiens laurentiens n'étaient pa superposables à ceux de l'Ontario. A nouveau, des conditions propices à l'agriculture auraient favorisé l'adoption de ce mode de subsistance plus tôt en Ontario que dans la portion québécoise du Saint-Laurent. Plus précisément, nous proposons que l'avènement hétérochronique de l'agriculture serait responsable de différences dans les règles sont déterminates de la composition biologique d'une population.

Key Words: **St. Lawrence Iroquoians, Ontario Iroquoians, Craniometric traits, Dentition, Physical environment, Adaptation.**

INTRODUCTION

Avant les années '70, l'idée que l'on se faisait de la préhistoire des Iroquoiens du Québec était essentiellement le produit d'une extrapolation des découvertes archéologiques effectuées en Ontario et dans l'Etat de New-York. Dans cette préhistoire, les Iroquoiens du Saint-Laurent occupaient une place plutôt secondaire: ou leur évolution était étroitement dépendante de celle des autres groupes iroquoiens, ou elle était tout simplement assimilée à celle de ces autres groupes. Au mieux, étions-nous en mesure d'affirmer que les populations de la plaine laurentienne avaient connu un développement *in situ* depuis ca. 1250 ap. J.C. Or, l'essor qu'a connu l'archéologie québécoise depuis environ quinze ans (voir Martijn 1978 et Clermont 1982) a permis d'élargir considérablement, à la fois dans ses dimensions spatiale et temporelle, notre champ de connaissances des groupes humains qui habitaient les rives du Saint-Laurent à l'époque préhistorique. La découverte de sites, dans cette région de l'Iroquoisie jusqu'alors mal connue, fait dire aux archéologues québécois que leur évolution fut plus indépendante qu'on ne le croyait jadis de celle des autres Iroquoiens et que leurs racines laurentiennes plongeaient beaucoup plus profondément dans le temps.

On comprendra que les recherches ostéologiques au Québec sont, toute proportion gardée, encore moins développées que ne l'est l'archéologie. Mais indépendamment du retard qu'accuse toujours l'archéologie québécoise, il demeure peu probable que la quantité de restes humains trouvés au Québec ait été aussi importante qu'elle ne l'est dans d'autres coins de l'Iroquoisie. En effet, c'est dans la vallée du Saint-Laurent que la population aurait été la plus réduite (voir Clermont 1980). Qui plus est, il semble bien qu'aucun ossuaire, comme on en trouve en Ontario, ne sera mis au jour au Québec; les squelettes sont plutôt découverts dans des fosses individuelles ou contenant de deux à six individus. La grande dispersion des sépultures ne favorise donc pas leur découverte.

L'essor récent de l'archéologie en territoire québécois à permis de trouver d'autres restes humains, mais nous n'en possédons toujours qu'un nombre très réduit. Nous estimions néanmoins que la présente étude valait la peine d'être entreprise, en souhaitant que, conjointement avec le développement de l'archéologie, elle contribue à combler une lacune et ainsi à avoir une vision plus globale de la préhistoire des Iroquoiens. Mais comme les effectifs de nos échantillons sont faibles, et puisqu'il s'agit de la première recherche qui explore relativement à fond l'univers biologique des Iroquoiens du Québec, notre étude revêt nécessairement un caractère exploratoire. Nous voulons tout au plus soumettre un modèle en guise d'hypothèse de travail, qui permettrait éventuellement de mieux comprendre les processus d'adaptation bioculturelle dans le Québec préhistorique.

Nos analyses ont essentiellement porté sur quatre collections de crânes de la fin de la période préhistorique, ou de la période protohistorique. Dans un premier temps, nous chercherons à dégager les caractéristiques de chaque échantillon, et nous les comp arerons entre eux afin d'apprécier la variabilité de l'ensemble des individus soumis à l'analyse. Puis nous comparerons ces échantillons à deux collections de crânes iroquoiens de l'Ontario, très probablement contemporains de ceux du Québec; cette comparaison permettra pour la première fois de vraiment aborder la question du degré d'affinité biologique entre Iroquoiens du Québec et de l'Ontario. Il sera désormais possible de sonder plus à fond l'hypothèse généralement admise que les Iroquoiens du Saint-Laurent étaient biologiquement assimilables à ceux de l'Ontario.[2] Vu l'étroite interaction entre les dimensions biologique culturelle et environnementale, il va de soi que si l'assimilation culturelle est remise en question, l'assimilation biologique le soit aussi. Nous terminerons par une discussion où nous tenterons d'interpréter les résultats de nos analyses à l'aide de données archéologiques, ethnohistoriques et environnementales. Mais pour débuter, nous présenterons un bref historique des recherches anthropobiologiques ayant porté sur les Iroquoiens du Saint-Laurent. Ce rappel historique nous amènera à faire le point sur les connaissances actuelles et à circonscrire le problème qui est à l'origine de cette recherche.

LES ETUDES ANTHROPOBIOLOGIQUES ANTERIEURES

On s'en doute, cet historique se résume à bien peu de choses. Il débute néanmoins il y a plus de 120 ans, à l'occasion de la découverte à Montréal d'un site Iroquoien, qui pourrait être celui du village d'Hochelaga visité par Cartier en 1535.[3] J.W. Dawson, qui donna son nom au site, décrivit dans deux publications de l'époque (1860, 1861) les témoins culturels et les restes osseux des huit individus les plus complets. Il observa principalement que les crânes avaient la même conformation, mais que leurs dimensions étaient très variables, au point où il soupconna qu'ils pouvaient représenter plus d'une tribu ou qu'ils étaient ceux de métis. Bien qu'il les ait comparé à des crânes hurons et algonquins, il ne se prononca pas categoriquement sur leur identité ethnique. Il acquit tout au moins la conviction qu'ils étaient ceux d'Amérindiens. Les trois crânes décrits en 1860 avaient, dit-il, de grandes boîtes crâniennes (Dawson 1860: 433-434).

A la toute fin du XIXe siècle, et durant le premier quart du XXe, plusieurs découvertes isolées ont été faites sur l'île de Montréal. Elles donnèrent lieu à quelques publications (Lighthall 1898, 1899, 1922, 1924), mais aucune ne répresente une contribution majeure du point de vue ostéologique.

Il fallut attendre jusqu'en 1937 pour voir paraître une autre publication importante. Nous la devons à F.H.S. Knowles, qui fit une étude exhaustive des squelettes du site Roebuck, occupé à la fin de la periode préhistorique. La comparaison des crânes d'adultes attribués aux habitants du village, à ceux de nombreuses autres collections, l'amena à affirmer qu'ils ressemblaient davantage à ceux de Neutres qu'à ceux de Hurons ou d'Iroquois de l'Etat de New York (Knowles 1937: 50-51).

L'ouvrage de Knowles demeurera longtemps le plus complet, tant par la diversité de ses observations que par sa volonté de rendre compte de la variabilité biologique en faisant intervenir des facteurs environnementaux et socioculturels. Mais le principal stimulant faisait toujours défaut: les prochaines découvertes importantes de squelettes attribuables à des Iroquoiens du Saint-Laurent ne devaient avoir lieu qu'au début des années '70.

En 1972, J.E. Anderson réexamina la collection du site Dawson, entreposée au Musée McCord de l'Université McGill. Des dix individus observés, aucun ne put être identifié à l'un des huit décrits par Dawson. Anderson fut conduit à formuler trois conclusions: 1) les restes sont ceux d'Iroquoiens qui partageaient avec les Hurons, les Neutres, les Sénécas et les Onondagas un même ensemble de caractères métriques et morphologiques; 2) le groupe auquel ils seraient le plus étroitement apparentés est celui de Roebuck; 3) la denture témoigne d'un régime alimentaire mixte, basé sur la consommation de produits cultivés et des produits de la cueillette (Anderson 1972: 319-320).

Durant trois années consécutives, Clermont analysa trois autres collections d'Iroquoiens du Saint-Laurent. La première est celle du site de Mandeville, situé sur la rive ouest du Richelieu à quelques kilomètres de son embouchure (Clermont et Falardeau 1977). Les auteurs notèrent que les individus sont très homogenes et qu'ils se conforment au type iroquoien. L'usure des dents est considérable, et le taux de caries, comparable à celui du site Dawson et plus faible que ceux des groupes ontariens, traduirait un régime alimentaire moins lié à la consommation des produits agricoles que celui de ces derniers.

Le second échantillon étudie par Clermont est celui de la Place Royale, à Québec, qui livra les restes de dix individus iroquoiens. Leur appareil masticateur révélerait des modes de subsistance encore moins liés à l'agriculture que ne l'auraient été ceux qui prévalaient au sud du Québec, et *a fortiori* en Ontario. Ces individus se distinguaient de ceux de la plaine de Montréal non seulement par leur appareil masticateur, plus sain et plus robuste, mais aussi par un indice crânien plus élevé. L'auteur note toutefois que cette dernière observation repose sur des données très fragmentaires, mais quê

> si elles se verifiaient on pourrait des lors supposer que les Iroquoiens [des régions de Québec et de Montréal] avaient des réseaux préférentiels d'échanges génétiques légèrement différents et qu'il y avait, dans la Plaine laurentienne, au moins deux groupes (deux tribus ?) différents (Clermont 1978: 9-10).

La pauvreté de ces deux échantillons a forcément réduit la portée des analyses, mais Clermont put néanmoins formuler des hypothèses laissant entendre que certains groupes d'Iroquoiens du Québec étaient passablement différents l'un de l'autre. Il fut même conduit à envisager la possibilité que les Iroquoiens du Saint-Laurent n'étaient pas tous assimilables à ceux de l'Ontario.

La dernière collection étudiée par Clermont est celle du site de Lanoraie (Clermont 1979; voir aussi Clermont et al. 1983: 126-128), situé sur la rive nord du Saint-Laurent à quelque 50 kilometres en aval de Montréal. Les restes osseux, peu nombreux et fragmentaires, ont quand même permis de confirmer leur identité iroquoienne et de les assimiler sur la base des attributs odontologiques et des coutumes funéraires, aux autres Iroquoiens de la région de Montréal.

Pour terminer, mentionnons l'imposant ouvrage de synthèse de J.E. Molto sur les affinités biologiques entre divers groupes sylvicoles de l'Ontario, dont celui de Roebuck. L'une de ses conclusions est tout particulièrement pertinente à notre étude:

> it is reasonable to propose that the St. Lawrence Iroquois can be considered as active members of the Ontario Iroquois breeding population at this time [protohistoric and historic periods]. By this I mean that direct contact accounts for the close affinities between the St. Lawrence Iroquois and the other Iroquois groups in the protohistoric and historic times rather than the close affinities just reflecting common historical roots. St. Lawrence Iroquois potters, not just the pots, appear to be distributed throughout the Iroquois villages of southcentral Ontario and Huronia (Molto 1983: 256-257).

Molto est donc plus précis et plus catégorique que Knowles et Anderson. Il suggere, à toute fin pratique, de ne faire aucune distinction, sur le plan biologique, entre Iroquoiens du Saint-Laurent d'une part et Iroquoiens du centre-sud de l'Ontario et de la Huronie d'autre part. Et il ajoute que ses résultats tendent à confirmer l'ascendance Pickering des populations du Saint-Laurent (ibid.: 256).

Les conclusions de Molto s'opposent non seulement à ce que laissent présager les observations de Clermont, mais aussi aux conclusions tirées des données archéologiques. Chapdelaine estime que la culture matérielle des Iroquoiens du Saint-Laurent aurait davantage été influencée par les groupes Owasco de l'Etat de New York que par les groupes Pickering de l'Ontario (Chapdelaine 1980: 147-148). Il va aussi à l'encontre de Pendergast qui pense que "the St. Lawrence Iroquoians are the result of an in-situ development [under the influence of Pickering people] ... during the period A.D. 1250-1575" (Pendergast 1975: 50). Mais les archéologues québécois vont plus loin: ils affirment que les populations de la vallée du Saint-Laurent ont connu un développement culturel sur place qui remonterait à bien avant le Sylvicole supérieur, voire jusqu'à l'Archaique (Barré et Girouard 1978, Clermont 1978a, Clermont et Chapdelaine 1982).

Ces divergences d'opinions s'expliquent vraisemblablement en bonne partie par le fait que les préhistoriens ontariens fondent leurs hypothèses sur l'étude de collections provenant essentiellement, sinon exclusivement, de sites situés dans la partie ontarienne du Saint-Laurent. Elles ne sont donc probablement pas représentatives de l'ensemble des groupes iroquoiens qui habitaient les rives du fleuve. Ce biais ne pouvait être révélé que par des recherches intensives sur tout le territoire jadis occupé par les Iroquoiens préhistoriques. Mais ces divergences permettent néanmoins de préciser le problème de l'assimilation biologique et culturelle des Iroquoiens du Saint-Laurent à ceux de l'Ontario. Si nous devions rejeter cette assimilation, le ferions-nous pour tous les groupes qui ont occupé les rives du fleuve, ou seulement pour ceux qui vivaient le plus au nord par exemple? Dans un cas comme dans l'autre, il faudrait définir cette entité que formaient les Iroquoiens du Saint-Laurent. Etait-ce une entité politique, culturelle, biologique, géographique, ou tout cela à la fois? Il est plus probable qu'elle représenterait un découpage arbitraire de la réalité.

LES ECHANTILLONS

Nous possédons environ 50 crânes attribuables à des Iroquoiens du Québec. Le rejet des non adultes réduit notre échantillon à 38 sujets, dont certains sont très incomplets. Le problème de leur représentativité se pose donc de facon aigue, et devra être constamment présent à l'esprit. Les deux collections ontariennes totalisent 75 crânes d'adultes.

La collection Dawson

Il nous paraissait évident que la collection examinée par Anderson en 1972 était très incomplète, car au moins vingt squelettes auraient été exhumés (Dawson 1861: 363). Nos récentes investigations dans divers musées ont justement porté à vingt le nombre minimum d'individus de cette collection. Mais à nouveau, aucun des crânes ne peut être identifié de facon certaine à l'un de ceux décrits durant les vingt années qui ont suivi les découvertes (Dawson 1860, 1861, 1880; Wilson in Dawson 1861; Wilson 1876). L'impossibilité d'établir des associations peut être imputée aux descriptions incomplètes et imprécises de Dawson ou encore au bris des spécimens durant les 120 dernières années. Il faut également considérer que, parmi les crânes qui viennent de se rajouter à la collection analysée par Anderson, certains peuvent ne pas provenir du site Dawson, car ils ne sont qu'implicitement associés au site.

Relativement à l'identification de nos vingt individus, trois possibilités doivent être envisagées: 1) ils proviennent tous du site Dawson, et tous étaient membres de la communauté locale; 2) ils proviennent tous de ce site, mais certains étaient des étrangers qui furent ensevelis, pour une raison ou pour une autre, sur la terre de la communauté locale; 3) ils ne proviennent pas tous de ce site. Dans l'état actuel de la recherche, on ne peut dire laquelle des possibilités est la plus probable car, parmi les individus qui ont certainement été trouvés au site Dawson, la variabilité est importante. On ne peut donc raisonnablement exclure de l'échantillon aucun des autres individus, sur la base de ses caractères biologiques.

Aucun crâne n'est intact mais les plus complets sont cependant certainement associés au site. Les plus fragmentaires ont évidemment permis peu d'observations et de ce fait sont souvent exclus des analyses. Aux observations des dix-sept crânes adultes (11 mâles et 6 femelles) s'ajoutent celles prélevées sur de nombreux fragments isolés.

La collection Westmount

Cette collection a également des origines obscures et énigmatiques. Les quatre crânes du Musée national de l'Homme, à Ottawa, sont identifiés au catalogue du Musée comme étant des "Hochelagans and Mohawks from an ancient Iroquois site at Westmount, Montreal, P.Q.". Un cinquième provient du Musée McCord, à Montréal, et est ainsi identifié: "Red Indian skull. Found on side of Westmount Mountain...".

Selon Trigger (in Anderson 1972: 314), les crânes du Musée de l'Homme pourraient être ceux décrits par Lighthall en 1898. Nous pensons qu'il s'agirait plutôt de ceux dont il fait mention en 1924. Quoiqu'il en soit, les crânes de la présente collection, ainsi que les sépultures décrites par Lighthall (1898, 1899, 1922, 1924), soulèvent un problème d'identité ethnique (voir Larocque 1982: 51-52). Anderson et Trigger pensent que les spécimens du Musée de l'Homme seraient ceux d'Iroquoiens de l'île de Montréal et qu'ils remonteraient à la fin du Sylvicole supérieur (Anderson 1972: 314). A défaut de pouvoir se référer à un contexte archéologique, nous devons nous en remettre aux seuls caractères biologiques, et de ce point de vue, nous n'hesitons pas à affirmer qu'ils ont plus l'aspect d'Iroquoiens que d'Algonquiens.

Tous les crânes (4 mâles et 1 femelle) sont en parfait état de conservation; seule manque la mandibule de celui du Musée McCord. Un de ceux du Musée de l'Homme (une femme?) a été exclu des analyses en raison de son jeune âge.

La collection Mandeville

Le site Mandeville fut fouillé à plusieurs reprises au cours des années '70 sous la direction de Barré et Girouard (Girouard 1972; Mandeville et Séguin 1975). L'identité iroquoienne des individus et leur contemporanéité sont incontestables, mais à nouveau le nombre de sujets (5 mâles et 3 femelles) limite la représentativité de la collection.

La collection de la Place Royale

Des dix sépultures que livra le site de la Place Royale, seulement quatre étaient celles d'adultes (2 mâles et 2 femelles), et leur état de conservation est médiocre. Ce site, fouillé par Girouard et Mandeville, daterait de la toute fin du Sylvicole superieur (ca. 1500 ap. J.C.); sa contemporanéité avec celui de Mandeville n'est pas exclue (Girouard 1981, communication personnelle).

Autres Iroquoiens du Québec

Trois autres individus ont été inclus dans notre étude. L'un d'eux serait celui d'un Indien (un mâle) et daterait, selon les archives du Château Ramezay, de ca. 1500 ap. J.C. Les deux autres furent mis au jour par Wintemberg en 1927 au site de Lanoraie (voir Beaugrand-Champagne 1933 et Clermont et al. 1983), qui aurait été occupé entre 1300 et 1400 ap. J.C.; il s'agit d'un mâle et d'une femelle adultes. Ces trois sujets ne seront considérés que dans les comparaisons entre les collections québécoises et ontariennes.

La collection Syers

L'ossuaire duquel provient l'échantillon Syers est situé dans le comté de Durham, Ontario, à environ 40 km au sud-est du lac Simcoe. Tout comme Molto (1983: 91), nous pensons qu'il daterait de 1300-1500 ap. J.C. Bien que Boyle (1896) dit avoir extrait de cet ossuaire 57 crânes en bon état de conservation, nous n'avons pu en observer que 27 à l'Université de Toronto, soit 23 mâles et 4 femelles. Seulement deux mandibules faisaient partie de la collection examinée.

La collection Keffer

Situé dans le comté de York, au nord de Toronto, cet ossuaire livra quelque 50 crânes bien conserves sur un total d'environ 1000 individus (Boyle 1889-90). Nous le croyons plus récent que le précédent, vu sa proximité de la Huronie historique; nous le situons au XVIe siècle. L'échantillon est composé de 38 mâles et de 10 femelles. Quatre mandibules seulement ont pu être observées.

Les sex-ratios de ces deux collections sont pour le moins marginaux. Knowles (1937) et Molto (1938) ont également identifié plus de mâles que de femelles, mais à un degré moindre que nous. En ce qui nous concerne, l'identification du sexe fut faite par deux observateurs, et au cours de deux séances d'observations espacées de plusieurs mois, qui ont donné à toute fin pratique les mêmes résultats. La surreprésentation des mâles de la collection Syers pourrait en partie s'expliquer par l'absence de quelque 30 crânes de la collection originale. Nous reviendrons plus loin sur cette question des sex-ratios.

METHODE

Les variables

Pour cette recherche qui, rappelons-le, revêt un caractère exploratoire, il semblait indiqué de diversifier la nature de nos observations, et compte tenu des effectifs reduits, il aurait été encore plus contraignant de mettre l'accent sur un seul type de caractères. Nous avons utilisé des variables classiques (dimensions craniofaciales, traits épigénétiques et odontologiques) qui décrivent les grandes lignes des crânes étudiés.

Les caractères dits épigénétiques ont, plus que les variables métriques, la réputation d'être fortement déterminés génétiquement, d'où l'attrait qu'ils exercent sur plusieurs paléontologues. Mais un nombre croissant de chercheurs s'interrogent sérieusement sur leur degré et leur mode de transmission héréditaire et sur l'utilisation qui en est faite. Aujourd'hui, nous ne sommes plus très sûrs qu'ils sont plus aptes que les caractères métriques à démêler les liens biologiques entre deux ou plusieurs populations. Il sera difficile de trancher cette question aussi longtemps que les chercheurs formuleront des conclusions inconsistantes, voire contradictoires, à ce sujet. Dans ces circonstances, il est prématuré, et de toute facon au-dela de nos objectifs présents, de tenir compte des problèmes liés aux caractères discrets. Ceux que nous avons retenus tombent dans deux categories, soit ceux présents ou absents et ceux liés au degré de développement d'une structure osseuse.

Pour ce qui est des caractères odontologiques, nous nous en tiendrons ici aux taux de caries et de dents tombées *ante mortem*.

Les analyses statistiques

Nos faibles échantillons et l'état fragmentaire de plusieurs crânes ont considérablement limité les possibilités d'analyse statistique. Ainsi, l'utilisation de methodés univariées ne nous paraissait pas convenir plus que le recours à des modes de comparaison plus élémentaires. Même l'application du test de Student, dans les cas où les effectifs étaient très reduits ou très différents l'un de l'autre, n'a pas été jugée appropriée. Plusieurs tests statistiques n'ont donc pas été realisés. Pour pallier cette lacune, nous avons cru bon de recourir en certaines occasions à un mode de comparaison élémentaire ou de combiner deux tels modes de comparaison, plutôt que de procéder à un test statistique. Ainsi, avons-nous combiné la comparaison d'étendues et de coefficients de variation pour voir s'il y avait concordance dans les résultats. Ce faisant, nous accordons une importance (une signification?) à des tendances que peuvent afficher les variables, plutôt qu'à des différences statistiquement significatives entre les paramètres. Il est dès lors évident que l'intuition interviendra dans notre appréciation de la variation.

En ce qui à trait aux fréquences des v ariables discrètes, nous les avons soumises au test du χ^2 lorsque les effectifs étaient relativement élevés.

ANALYSE COMPARATIVE DES IROQUOIENS DU QUEBEC

Description générale

En première analyse, un attribut immédiatement évident de la collection **Dawson** est sa grande variabilité morphologique et métrique, comparativement à celles de Mandeville et Westmount. En outre, quelques individus se conforment peu au type iroquoien identifié par Anderson. Le dimorphisme sexuel y est plus marqué que dans les autres échantillons: les mâles ont des boîtes crâniennes très grandes, aux lignes arrondies, alors que le profil crânien des femelle s est plus anguleux. sur la plupart des sujets, on observe un aplatissement de la région lambdoîde et une protubérance de l'occipital. Le toit du crâne est souvent exhaussé et la pente biparietale est accusée.

La collection **Mandeville** présente une grande homogénéité, et le dimorphisme sexuel est faible. Aucun sujet n'a une apparence robuste et les profils montrent des lignes adoucies. Le toit du crâne n'est en aucun cas pyramidal, comme il s'en voit dans les échantillons de Dawson et Westmount. L'aplatissement de la région lambdoide et la protuberance de l'occipital, lorsqu'ils sont presents, ne sont jamais prononcés. Tout comme dans la collection Westmount, le vertex des mâles est en position plus reculée qu'il ne l'est chez ceux de Dawson.

Les mâles de la collection **Westmount** ont un aspect assez robuste. Les arcades sourcilières y sont les plus proéminentes. Nous ne retrouvons pas dans cette collection, ni dans celles de Mandeville et de la Place Royale, des crânes au toit rond et exhaussé et au frontal developpé comme il y en à dans l'échantillon Dawson. Les bosses pariétales sont plus prononcées et plus élevées que chez les gens de Dawson et, en conséquence, la pente bipariétale est moins accentuée. La face est plus étroite, en valeur absolue et relative, que dans les autres collections et les cavités orbitaires sont relativement plus hautes.

L'état fragmentaire des crânes de la **Place Royale** à permis très peu d'observations. Soulignons quand même qu'ils affichent une platycrânie marquée et de fortes empreintes musculaires. Les deux seuls individus dont on a pu évaluer l'indice crânien seraient brachycrânes, les indices se situant autour de 80. Mais le matériel de la Place Royale se distingue surtout par la robustesse des mandibules.

Variables métriques

Nous ne soulignerons ici que des observations générales et des tendances, plutôt que des différences ponctuelles comme peuvent en reveler des indices.

Le tableau 1 montre que les dimensions crâniennes des mâles des échantillons Mandeville et Westmount diffèrent peu, tandis que celles de Dawson sont systématiquement les plus fortes. Bien que ces variables soient corrélées positivement, elles confirment néanmoins le fait que les mâles de Dawson ont nettement les plus grandes boîtes crâniennes. Le module témoigne également de cette caractéristique; le seul que nous avons pu calculer est de toute évidence à 159, le plus faible chez les mâles du site Dawson. Les dimensions de la face n'affichent nullement cette tendance, tout comme l'ensemble des dimensions des femelles.

On note aussi que les dimensions de la mandibule sont plus fortes au site de la Place Royale, surtout celles mesurant la robustesse du corps. A nouveau, les données métriques concordent avec une des principales observations mentionnées dans la section précédente.

Les étendues révèlent, dans la mesure où l'on peut s'y fier, que les dimensions crâniennes des mâles de l'échantillon Dawson sont généralement plus variables que dans les autres collections (tableau 2). Ces variables affichent également un dimorphisme sexuel plus marqué chez les gens de Dawson que chez ceux de Mandeville.

Variables non-métriques et odontologiques

Il ne se dégage aucune tendance nette parmi les variables discrètes, bien que les fréquences de la collection Dawson soient plus souvent voisines de celles de la collection Westmount que de celles de Mandeville. Les données odontologiques permettent cependant de classer dans une catégorie à part les gens de la Place Royale: ils ont, et de loin, les plus faibles taux de chutes *ante mortem* et de caries (tableau 8). De plus, l'usure est beaucoup plus avancée sur les dents antérieures que sur les dents jugales, sauf à la Place Royale où elle est uniforme.

Les observations générales que nous venons de dégager reposent bien sûr sur des données très fragmentaires. Mais si la découverte de nouveaux restes humains venaient les renforcer, nous pourrions alors affirmer avec plus de conviction que les Iroquoiens de l'île de Montréal étaient particulièrement originaux et hétérogènes en comparaison de ceux qui habitaient plus au nord, et que ceux habitant le plus au nord avaient un appareil masticateur plus sain et plus robuste.

ANALYSE COMPARATIVE ENTRE IROQUOIENS DU QUEBEC ET DE L'ONTARIO

Notre but n'étant pas ici de comparer les collections de Syers et de Keffer entre elles, nous passerons vite sur ce sujet, qui a d'ailleurs été aborde dans un autre ouvrage (Larocque 1982). Nous tenons néanmoins à souligner les deux différences qui ressortent le mieux; elles touchent les

TABLEAU 1
Dimensions et indices moyens (mâles et femelles) de échantillons du Québec

	Mandeville ♂		Dawson ♂		Westmount ♂		Place Royale ♀		Mandeville ♀		Dawson ♀		Place Royale ♀	
	N	χ	N	χ	N	χ	N	χ	N	χ	N	χ	N	χ
L. max. du crâne	3	185.0	4	194.5	4	183.25	—	—	2	172.0	4	179.75	—	—
B. max. du crâne	3	139.33	4	147.25	4	140.75	—	—	3	133.67	4	131.75	—	—
B. front. min	3	94.33	6	97.0	4	94.25	—	—	2	91.0	3	87.0	1	98.0
C. nas.breg	3	107.33	5	119.4	4	110.75	—	—	1	108.0	3	109.67	1	113.0
C. breg.lamb.	5	109.0	7	113.43	4	107.75	—	—	3	106.0	5	106.4	1	107.0
C. lamb.opist.	3	97.66	3	100.0	4	96.0	—	—	2	95.5	2	94.0	1	96.0
A. breg.porion	5	151.4	4	157.25	4	150.0	—	—	3	152.33	3	144.67	—	—
P. max. du crâne	3	506.66	4	533.75	4	506.0	—	—	—	—	3	485.0	—	—
H. bas.breg	4	132.0	2	134.0	4	135.0	—	—	3	137.0	2	129.5	—	—
B. bizygom.	2	141.5	1	148.0	4	136.0	—	—	1	121.0	1	123.0	—	—
H. sup.face	2	71.5	1	68.0	4	67.5	—	—	1	59.0	1	63.0	—	—
H. du nez	2	55.5	1	53.0	4	52.75	—	—	1	50.0	1	48.0	—	—
B. du nez	2	28.5	1	26.0	4	26.0	—	—	1	27.0	1	27.0	—	—
H. de l'orbite	2	34.5	1	33.0	4	34.5	—	—	1	33.0	1	34.0	—	—
B. de l'orbite	2	47.0	1	47.0	4	45.5	—	—	1	42.0	1	44.0	—	—
B. bigoniague	2	108.0	1	108.0	3	107.66	—	—	—	—	1	98.0	2	107.0
B. min. branche	4	36.25	2	36.0	3	38.0	—	—	1	27.0	2	28.5	2	35.5
L. max. mandib.	2	108.0	1	112.0	3	110.66	—	—	2	102.5	1	113.0	2	105.0
H. à la M2	1	28.0	1	29.0	2	28.0	1	33.0	1	20.0	1	22.0	1	29.0
E. à la M2	4	18.75	3	19.66	3	18.66	1	22.0	2	16.5	3	18.33	2	20.5
H. à la symphyse	3	35.33	3	35.0	3	33.33	1	40.0	2	30.0	3	31.33	2	34.5
E. à la symphyse	3	17.66	3	16.66	3	16.0	1	19.0	2	14.5	4	16.25	2	16.0
Module	2	151.33	1	159.0	4	153.0	—	—	2	147.17	2	145.67	—	—
Ind. crânien	3	75.32	4	75.87	4	76.86	—	—	2	77.92	4	73.36	—	—
Ind. H.-L.	2	70.46	1	68.88	4	73.74	—	—	2	78.83	2	74.25	—	—
Ind. H.-B.	2	93.19	1	92.47	4	95.91	—	—	3	102.52	2	97.37	—	—
Ind. craniofac.	2	101.43	1	101.37	4	96.62	—	—	1	91.67	1	92.48	—	—
Ind. facial sup.	2	50.52	1	45.05	4	49.57	—	—	1	48.76	1	51.22	—	—
Ind. nasal	2	51.58	1	49.06	4	49.28	—	—	1	54.0	1	56.25	—	—
Ind. orbitaire	2	73.46	1	70.21	4	75.82	—	—	1	78.57	1	77.27	—	—

A. arc; B. largeur; C. corde; E. épaisseur; H. hauteur; P. périmètre

TABLEAU 2
Etendues et diffrences dans les moyennes et les indices entre mâles et femelles des échantillons du Québec

	Etendue ♂ Mandeville	♀	Etendue ♂ Dawson	♀	Etendue ♂ Westmount	χ ♂ — χ ♀ Mandeville	Dawson
L. max du crâne	3	8	22	21	11	13.0	14.75
B. max du crâne	1	4	6	15	5	5.66	15.5
B. front. min.	3	4	6	9	12	3.33	10.0
C. nas. breg	7	—	6	11	7	−0.67	9.73
C. breg. lamb.	8	22	21	19	9	3.0	7.03
C. lamb. opist,	3	3	8	4	4	2.16	6.0
A. breg. porion	14	3	19	18	10	−0.93	12.58
P. max. du crâne	6	—	37	17	16	—	48.75
H. bas. breg.	5	5	2	5	8	−5.0	5.5
B. bizygom.	3	—	—	—	16	20.5	25.0
H. sup. face	3	—	—	—	14	12.5	5.0
H. du nez	5	—	—	—	10	5.5	5.0
B. du nez	3	—	—	—	6	1.5	−1.0
H. de l'orbite	1	—	—	—	3	1.5	−1.0
B. de l'orbite	2	—	—	—	3	5.0	3.0
B. bigoniague	0	—	—	—	7	—	10.0
B. min. branche	6	—	4	7	3	9.25	7.5
L. max. mandib.	2	5	—	—	3	5.5	−1.0
H. à la M2	—	—	—	—	4	8.0	7.0
E. à la M2	4	1	3	1	6	2.25	1.33
H. à la symphyse	2	4	5	5	4	5.33	3.67
E. à la symphyse	1	1	2	2	2	3.16	0.41
Module	1.33	3.66	—	0	2.33	4.16	13.33
Ind. crânien	1.77	1.3	9.43	7.83	7.35	−2.6	2.51
Ind. H. -L.	0.06	4.25	—	4.99	8.81	−8.37	−5.37
Ind. H. -B.	2.1	6	—	3.76	2.26	−9.33	−4.9
Ind. craniofacial	1.42	—	—	—	9.23	9.76	8.89
Ind. facial sup.	1.05	—	—	—	5.0	1.76	−5.27
Ind. nasal	10.05	—	—	—	5.02	−2.42	−7.19
Ind. orbitaire	5.25	—	—	—	3.94	−5.11	−7.06

A. arc; B. largeur; C. corde; E. épaisseur; H. hauteur; L. longueur; P. périmètre

taux de caries et les mesures de dispersion. Disons tout de suite que l'on à relevé, dans l'échantillon de Keffer, un taux de caries particulièrement faible, trois fois moindre que celui de l'échantillon Syers (tableau 8).

D'autre part, la comparaison des coefficients de variation chez les mâles (tableau 4) montre que, pour plus du 2/3 des variables, le coefficient est plus élevé dans la collection Syers que dans celle de Keffer. Cette tendance à une plus grande hétérogénéité s'accentue si nous excluons les variables de la mandibule, qui sont toutes peu répresentées. Les étendues ne trahissent pas cette tendance, mais seulement deux tests de F sont significatifs à $p \leq 0.05$. Elle ressort même si les mâles de Syers sont mis en présence de l'ensemble des mâles du Québec (tableaux 4 et 5): sur 23 coefficients de variation (ceux de la mandibule sont exclus), 20 sont plus élevés dans la collection Syers. L'ensemble des mâles du Québec et celui de Keffer sont, de ce point de vue, beaucoup plus comparables.

La forte hétérogénéité des mâles de Syers pourrait s'expliquer par la présence parmi eux de femelles, vu la sous-répresentation marquée de ces dernières. Pour tester cette possibilité, nous avons comparé les écarts-type de nos échantillons masculins à ceux obtenus par Howells à partir de 17 échantillons des cinq continents. "These figures are probably the best available generalized estimates of the standard deviation for any given measurement for mankind in general (Howells 1973: 214). Ces écarts-type sont appelés WI EST (pour within group estimate). Voici, pour les douze variables que nous avions en commun avec Howells, le résultat des comparaisons:

		Syers ♂	Keffer ♂	Ontario ♂	Québec ♂
WI EST ♂	plus petit	10	3	9	7
WI EST ♂	comparable	2	5	3	1
WI EST ♂	plus grand	0	4	0	4

Ces chiffres montrent que, du point de vue de la variabilité intragroupe, nous n'avons pas de raison de croire que l'échantillon mâle de Keffer dont le sex-ratio favorise aussi les mâles contient des crânes femelles. Puisque les deux collections ontariennes ont été examinées par les deux mêmes observateurs, nous sommes donc enclins à croire que les sex-ratios sont également fiables. Rappelons, à propos de la forte variabilité des mâles de Syers, que des calculs de distances entre plusieurs groupes iroquoiens effectués par Webb (1972: 153), révèlent que cet échantillon mâle est le seul à ne jamais être très distant

TABLEAU 3

Dimensions et indices moyens (mâles et femelles) et différences de moyennes entre les sexes des échantillons de l'Ontario

	Syers ♂		Keffer ♂			Syers ♀		Keffer ♀		χ ♂ χ ♀	
	N	χ	N	χ	t	N	χ	N	χ	Syers	Keffer
L. max. du crâne	23	182.61	36	184.83	−1.11	4	174.5	10	178.2	8.1	6.63
B. max. du crâne	23	138.13	37	135.97	1.66	4	131.25	10	135.1	6.88	0.87
B. front. min	22	94.32	36	93.28	0.82	4	88.75	10	89.1	5.57	4.17
C. nas. breg	21	111.66	35	112.43	−0.56	4	104.25	8	109.25	7.41	3.17
C. breg. lamb.	23	110.69	37	110.43	0.15	4	103.25	10	107.9	7.44	2.53
c. lamb. opist.	20	96.05	22	100.5	−3.08 **	4	97.0	9	96.44	−0.95	4.06
A. breg. porion	22	150.27	33	150.79	−0.35	3	144.33	10	145.6	5.94	5.18
P. max. du crâne	22	509.09	37	508.0	0.27	4	485.75	10	497.8	23.34	10.2
H. bas. breg.	23	132.22	19	136.63	−2.77 **	3	127.33	7	130.57	4.88	6.06
B. bizygon.	13	136.77	17	138.41	−0.81	1	125.0	3	125.0	11.77	13.41
H. sup. face	15	69.53	13	68.0	0.94	2	63.5	3	65.66	6.03	2.34
H. du nez	15	52.8	13	53.77	−0.69	2	52.5	3	51.66	0.3	2.11
B. du nez	14	26.57	11	27.0	−0.39	2	23.5	2	28.5	3.07	−1.5
H. de l'orbite	17	35.23	13	34.0	1.7	2	38.0	3	36.0	−2.77	−2.0
B. de l'orbite	17	44.12	13	44.85	−1.13	2	44.0	3	43.33	0.12	1.51
B. bigoniague	2	98.0	4	98.25	—	—	—	—	—	—	—
B. min. branche	2	34.5	4	35.25	—	—	—	—	—	—	—
L. max. mandib.	2	104.5	4	112.75	—	—	—	—	—	—	—
H. à la M2	2	21.5	2	27.0	—	—	—	—	—	—	—
E. à la M2	2	17.5	4	18.75	—	—	—	—	—		—
H. à la symphyse	2	31.0	4	33.25	—	—	—	—	—		—
E. à la symphyse	2	17.0	4	17.25	—	—	—	—	—	—	—
Module	23	150.98	19	152.84	−1.4	3	142.55	7	148.09	8.43	4.75
Ind. crânien	23	75.76	36	73.6	2.24 *	4	75.18	10	75.83	0.58	−2.23
Ind. H.-L.	23	72.5	19	73.79	−1.28	3	73.61	7	73.2	−1.11	0.59
Ind. H.-B.	23	95.88	19	100.13	−2.58 *	3	100.07	7	96.75	−4.19	3.38
Ind. craniofac.	13	99.53	17	101.52	−1.3	1	96.15	3	93.99	3.38	7.53
Ind. facial sup.	13	50.85	11	49.44	1.31	1	48.0	2	53.37	2.85	−3.93
Ind. nasal	14	50.61	11	50.23	0.19	2	44.72	2	54.21	5.89	−3.98
Ind. orbitaire	17	79.93	13	75.91	2.27 *	2	86.35	3	83.13	−6.42	−7.23

A. arc; B. largeur; C. corde; E. épaisseur; H. hauteur; L. longueur; P. périmètre

* significatif à 0.05; ** significatif à 0.01

TABLEAU 4
Ecarts-type et coefficients de variation (mâles) et étendues (mâles et femelles) des échantillons de l'Ontario

	Syers ♂		Keffer ♂			Etendue	Etendue			
	S−x	V	S−x	V	F	WI EST	♂ Syers	♀	♂ Keffer	♀
L. max. du crâne	9.02	4.94	6.4	3.46	1.99	5.82	35	8	27	16
B. max. du crâne	5.79	4.19	4.24	3.12	1.86	4.95	24	18	17	13
B. front. min.	5.65	5.99	3.99	4.28	2.01	—	19	9	19	16
C. nas. breg.	5.57	4.99	4.44	3.95	1.57	4.52	20	4	19	13
C. breg. lamb.	7.73	6.98	5.68	5.14	1.85	5.34	31	15	24	17
C. lamb. opist.	5.2	5.42	4.14	4.12	1.58	5.14	20	17	15	14
A. breg. porion	5.3	3.53	5.47	3.63	1.06	—	19	10	22	18
P. max. du crâne	18.67	3.67	12.02	2.36	2.42 *	—	69	30	49	46
H. bas. breg.	5.6	4.23	4.52	3.31	1.53	4.96	25	9	17	7
B. bizygom.	6.65	4.86	4.44	3.21	2.24	4.42	23	—	16	2
H. sup. face	4.48	6.45	4.04	5.94	1.23	3.98	14	7	14	8
H. du nez	3.57	6.76	3.83	7.13	1.15	2.7	14	1	14	7
B. du nez	3.32	12.5	1.55	5.74	4.6 *	1.83	10	5	5	5
H. de l'orbite	2.01	5.72	1.91	5.63	1.11	1.93	7	2	6	3
B. de l'orbite	1.83	4.15	1.62	3.62	1.27	1.61	6	2	5	3
B. bigoniague	4.24	4.33	6.5	6.61	—	—	6	—	15	—
B. min. branche	0.7	2.05	4.57	12.97	—	—	1	—	10	—
L. max. mandib.	3.53	3.38	4.5	3.99	—	—	5	—	11	—
H. à la M2	0.7	3.29	1.41	5.24	—	—	1	—	2	—
E. à la M2	0.7	4.04	1.5	8.0	—	—	1	—	3	—
H. à la symphyse	2.83	9.12	1.71	5.13	—	—	4	—	4	—
E. à la symphyse	1.41	8.32	1.26	7.29	—	—	2	—	3	—
Module	4.98	3.3	3.17	2.07	2.47	—	19.33	2.67	10.67	9
Ind. crânien	3.93	5.18	3.41	4.63	1.33	—	14.86	7.73	12.96	5.6
Ind. H.-L.	3.47	4.78	3.02	4.1	1.32	—	12.16	5.68	10.91	8.32
Ind. H.-B.	5.82	6.07	4.61	4.6	1.6	—	20.55	10.96	15.4	12.56
Ind. craniofac.	4.86	4.88	3.52	3.47	1.9	—	17.49	—	13.28	2.19
Ind. facial sup.	2.53	4.98	2.7	5.46	1.14	—	8.77	—	7.8	5.95
Ind. nasal	5.88	11.62	3.21	6.39	3.35	—	20.4	8.61	10.84	15.57
Ind. orbitaire	4.56	5.7	5.11	6.74	1.26	—	15.7	0.62	17.96	9.02

A. arc; B. largeur; C. corde; e. épaisseur; H. hauteur; L. longueur; P. périmètre

* significatif à 0.05

TABLEAU 5

Dimensions et indices moyens, et diverses mesures de dispersion de l'ensemble des mâles de l'Ontario et de celui des mâles du Québec

	Ontario ♂		Québec ♂			Ontario ♂			Québec ♂			
	N	$\bar{x}$	N	$\bar{x}$	t	Etendue	S_x	V	Etendue	S_x	V	WI EST
L. max. du crâne	59	183.96	13	188.31	−1.88	35	7.54	4.1	29	7.58	4.03	5.82
B. max. du crâne	60	136.8	13	143.69	−4.56 **	28	4.95	3.62	15	4.89	3.4	4.95
B. front.min.	58	93.67	15	95.8	−1.62	19	4.67	4.98	15	3.85	4.03	—
C. nas. breg.	56	112.14	14	114.0	−1.22	21	4.86	4.33	20	5.92	5.2	4.52
C. breg. lamb.	60	110.53	18	110.72	−0.11	33	6.48	5.86	21	5.86	5.29	5.34
C. lamb. opist.	42	98.38	12	98.33	0.03	20	5.13	5.22	12	3.63	3.69	5.14
A. breg. porion	55	150.58	15	153.2	−1.55	22	5.36	3.56	24	7.18	4.69	—
P. max. du crâne	59	508.4	13	518.92	−2.23 *	69	14.7	2.89	60	18.25	3.51	—
H. bas. breg.	42	134.21	12	134.66	−0.26	28	5.54	4.13	15	3.98	2.96	4.96
B. bizygom.	30	137.7	7	139.28	−0.66	24	5.46	3.97	21	6.65	4.77	4.42
H. sup. face	28	68.82	7	68.71	0.06	14	4.28	6.21	14	4.71	6.86	3.98
H. du nez	28	53.25	8	53.87	−0.43	18	3.66	6.87	10	3.56	6.61	2.7
B. du nez	25	26.76	8	26.75	0.01	10	2.65	9.9	7	2.19	8.18	1.83
H. de l'orbite	30	34.7	8	34.5	0.26	9	2.03	5.87	3	1.19	3.46	1.93
B. de l'orbite	30	44.43	8	46.12	−2.55 *	6	1.75	3.95	4	1.24	2.7	1.61
B. bigoniague	6	98.16	6	107.83	−4.06 **	15	5.38	5.48	7	2.23	2.06	—
B. min. branche	6	35.0	9	36.78	−1.2	10	3.58	10.22	6	2.22	6.04	—
L. max. mandib.	6	110.0	6	110.0	0	16	5.72	5.2	5	2.0	1.82	—
H. à la M2	4	24.25	5	29.2	−2.53 *	7	3.3	13.62	7	2.59	8.86	—
E. à la M2	6	18.33	11	19.27	−0.98	3	1.36	7.45	7	2.1	10.9	—
H. à la symphyse	6	32.5	10	35.1	−2.05	6	2.17	6.67	8	2.6	7.4	—
E. à la symphyse	6	17.16	10	17.0	0.26	3	1.17	6.81	4	1.24	7.33	—
Module	42	151.82	9	154.85	−1.9	19.33	4.31	2.84	14.0	4.41	2.85	—
Ind. crânien	59	74.44	13	76.37	−1.74	14.92	3.74	5.02	10.85	2.92	3.83	—
Ind. H.-L.	42	73.08	9	72.37	0.6	12.43	3.3	4.52	9.77	2.93	4.05	—
Ind. H.-B.	42	97.81	9	94.49	3.2 **	22.09	5.66	5.79	5.08	1.67	1.76	—
Ind. craniofac.	30	100.66	7	98.67	1.14	17.49	4.19	4.17	12.07	4.04	4.09	—
Ind. facial sup.	24	50.2	7	49.32	0.79	9.79	2.65	5.28	6.5	2.27	4.6	—
Ind. nasal	25	50.44	8	49.69	0.41	20.4	4.8	9.52	10.6	3.32	6.69	—
Ind. orbitaire	30	78.18	8	76.83	1.75	22.61	5.41	6.57	8.05	3.01	4.02	—

a. arc; B. largeur; C. corde; E. épaisseur; H. hauteur; L. longueur; P. périmètre

* significatif à 0.05; ** significatif à 0.01

le test de F est significatif à 0.05 pour la longueur de la mandibule et à 0.01 pour l'indice de hauteur-largeur.

des autres groupes. Ce fait est compatible avec une forte hétérogénéité des mâles de la collection Syers.

Nous mettrons maintenant en présence l'ensemble des sujets du Québec à celui des sujets de l'Ontario. Comme nous l'avons vu, chacun de ces deux ensembles serait composé d'échantillons dissemblables à divers degrés, donc non parfaitement superposables. Nous croyons néanmoins que ces regroupements illustrent une partie de la variabilité biologique qu'affichaient, vers la fin du Sylvicole supérieur, les Iroquoiens du Québec d'une part et ceux de l'Ontario d'autre part. Ils constitueront donc la base de notre analyse comparative inter-régionale.

Variables métriques

Sur les 22 mesures craniofaciales, 16 sont en moyenne supérieures chez les mâles du Québec (tableau 5). Ceux de Dawson ne sont pas les seuls à contribuer à cette tendance, plus particulièrement au niveau des dimensions de la face. Les échantillons femelles n'affichent pas cette tendance. D'autre part, seulement deux variables avaient, chez les mâles, des variances significativement différentes: la longueur de la mandibule, à $p \leq 0.05$, et l'indice de hauteur-largeur, à $p \leq 0.01$ (tableau 5). Mais les 2/3 des coefficients de variation sont plus élevés parmi les mâles de l'Ontario. La grande variabilité des crânes de Syers explique bien sûr une bonne part de ces écarts. Aucune tendance ne peut être dégagée des données disponibles sur les échantillons femelles.

Dans la comparaison des étendues entre mâles et femelles d'un même groupe, nous n'avons retenu que les variables dont l'effectif est d'au moins cinq pour chaque sexe. Nous obtenons que sur les 18 variables ainsi sélectionnées dans le groupe de l'Ontario, toutes ont une étendue plus grande chez les mâles, tandis qu'une telle relation ne s'observe que pour neuf variables sur seize dans la collection du Québec (tableaux 5 et 6). Dans la mesure où les étendues et les effectifs réduits nous permettent d'en juger, les mâles seraient donc, relativement aux femelles, plus variables dans l'échantillon de l'Ontario que dans celui du Québec.

Variables non-métriques et odontologiques

Les fréquences de cinq variables non-métriques sont significativement différentes à $p \leq 0.01$ (tableau 7). La forte corrélation qui peut exister entre ces fréquences réduit quelque peu l'intérêt de cette observation. La proportion de dents tombées avant la mort ne diffère pratiquement pas (tableau 8), mais le pourcentage de caries est nettement plus élevé en Ontario, sans toutefois être significativement supérieur.

TABLEAU 6
Dimensions et indices moyens et étendues (femelles), et différences de moyennes entre les sexes, échantillon de l'Ontario et échantillon du Québec

	Ontario ♀		Québec ♀		Etendue ♀		$\bar{\chi}$ ♂ — $\bar{\chi}$ ♀	
	N	$\bar{\chi}$	N	$\bar{\chi}$	Ontario	Québec	Ontario	Québec
L. max. du crâne	14	177.14	6	177.16	16	25	6.82	11.14
B. max. du crâne	14	134.0	7	132.57	19	15	2.8	11.12
B. front. min.	14	89.0	6	90.16	16	17	4.67	5.64
C. nas. breg.	12	107.58	5	110.0	13	11	4.56	4.0
C. breg. lamb.	14	106.57	9	109.33	19	23	3.96	4.39
C. lamb. opist.	13	96.61	5	95.0	17	5	1.76	3.33
A. breg. porion	13	145.31	6	148.5	18	18	5.28	4.7
P. max. du crâne	14	494.35	3	485.0	46	17	14.05	33.92
H. bas. breg.	10	129.6	5	134.0	12	13	4.61	0.66
B. bizygom.	4	125.0	2	122.0	2	2	12.7	17.28
H. sup. face	5	64.8	2	61.0	11	4	4.02	7.71
H. du nez	5	52.0	2	49.0	7	2	1.25	4.78
B. du nez	4	26.0	2	27.0	10	0	0.76	−0.25
H. de l'orbite	5	36.8	2	33.5	5	1	−2.1	1.0
B. de l'orbite	5	43.6	2	43.0	3	2	0.83	3.12
B. bigoniague	—	—	4	104.5	—	14	—	3.33
B. min. branche	—	—	6	31.66	—	11	—	5.11
L. max. mandib.	—	—	6	105.33	—	13	—	4.67
H. à la M2	—	—	5	25.8	—	10	—	3.4
E. à la M2	—	—	8	18.62	—	5	—	0.65
H. à la symphyse	—	—	8	32.0	—	7	—	3.1
E. à la symphyse	—	—	9	15.78	—	3	—	1.23
Module	10	146.43	4	146.41	11.0	3.66	5.39	8.44
Ind. crânien	14	75.65	6	74.88	7.91	9.08	−1.2	1.49
Ind. H.-L.	10	73.32	4	76.54	8.33	9.20	−0.24	−4.17
Ind. H.-B.	10	97.74	5	100.46	16.6	9.77	0.06	−5.97
Ind. craniofac.	4	94.53	2	92.07	2.92	0.81	6.13	6.6
Ind. facial sup.	3	51.58	2	49.99	8.35	2.46	−1.38	−0.66
Ind. nasal	4	49.46	2	55.12	21.6	2.25	0.98	−5.43
Ind. orbitaire	5	84.42	2	77.92	9.02	1.30	−6.24	−3.09

A. arc; B. largeur; C. corde; E. épaisseur; H. hauteur; L. longueur; P. périmètre

TABLEAU 7

Fréquences des variables non métriques, échantillons de l'Ontario et échantillon du Québec

variable	Syers f	Syers %	Keffer f	Keffer %	Syers Keffer χ^2	Ontario f	Ontario %	Québec f	Québec %	Québec χ^2
acuité du bord infranasal[1]	10/18	55.6	11/17	64.7	0.3	21/35	60.0	12/20	60.0	0
trou sus-orbitaire	33/53	62.2	49/91	53.8	0.97	82/144	56.9	29/51	56.8	0.0001
encoche sus-orbitaire	27/54	50.0	56/93	60.2	1.45	83/147	56.5	40/56	71.4	3.8
arcades sourchilières[1,2]	13/23	56.5	28/38	73.7	1.91	41/61	67.2	15/20	75.0	0.43
suture métopigue	0/27	0.0	0/48	0.0	—	0/75	0.0	0/35	0.0	—
carêne sagitale[1]	7/27	25.9	12/47	25.5	0.001	19/47	25.7	10/37	27.03	0.023
aplatissement sus-lambdoide[1]	24/27	88.9	31/47	66.0	4.72 *	55/74	74.3	14/33	42.4	10.14**
proéminance occipitale[1]	9/27	33.3	20/47	42.6	0.61	29/74	39.2	19/27	70.4	7.71**
relief musculaire[1,2]	13/23	56.5	22/36	61.1	0.12	35/59	59.3	13/17	76.5	1.67
os inca	3/27	11.1	3/44	6.8	0.4	6/71	8.5	1/27	3.7	0.66
os lambdoide	29/52	55.7	41/85	48.2	0.73	70/137	51.1	37/46	80.4	12.2**
os astétique	0/50	0.0	1/88	1.1	0.57	1/138	0.7	5/36	13.9	14.86**
déhiscence tympanique	19/47	40.4	48/78	61.5	5.25 *	67/125	53.6	7/49	14.3	22.26**
apophyses geni[1]	1/2	50.0	3/4	75.0	—	4/6	66.7	11/22	50.0	0.53
arc mylohyoidien	0/4	0.0	1/8	12.5	—	1/12	8.3	5/30	16.6	0.48
trous mentonniers doubles	0/4	0.0	0/8	0.0	—	0/12	0.0	2/40	5.0	0.62

1. les fréquences de ces variables correspondent au nombre d'observations où le caractère est marqué.
2. seuls les mâles ont été considérés pour ces variables.

* le test est significant à 0.05 ** le test est significant à 0.01

Note: les fréquences des variables bilatérales ont été calculées par rapport au nombre d'observation at non par rapport au nombre d'individus.

TABLEAU 8

Variables odontologiques, tous les échantillons

	dents observées N	dents ante perdues mortem f	dents ante perdues mortem %	dents post perdues mortem f	dents post perdues mortem %	caries f	caries %	incisives en forme de pelle f	incisives en forme de pelle %
Mandeville	169*	33/210	15.7	28/210	13.3	25/169	14.8	18/25	72.0
Dawson	113*	49/196	25.0	45/196	22.9	19/113	16.8	10/21	47.6
Westmount	25	12/135	8.8	98/135	72.6	4/25	16.0	—	—
Place Royale	75	2/101	2.0	32/101	31.7	6/75	8.0	6/8	75.0
Autres	28	3/46	6.5	15/46	32.6	5/28	17.8	0/8	0.0
Syers	84	44/284	15.5	156/284	54.9	24/84	28.6	—	—
Keffer	59	41/266	15.4	166/266	62.4	6/59	10.2	—	—
Ontario	143	85/550	15.5	322/550	58.5	30/143	20.9	—	—
Québec	410*	99/688	14.4	218/688	31.7	59/410	14.4	34/62	54.9

* sont incluses quelques dents isolées

TABLEAU 9
Taux de caries et de dents tombées ante mortem des échantillons du Québec at de divers échantillons de l'Ontario

Echantillon	Ancienneté (A.D.)	dents perdues ante mortem f	%	caries f	%
Le Vesconte[a]	125-200	53/659	8.04	22/335	6.6
Serpent Mound[b]	100-300	111/1264	8.8	23/885	2.6
Serpent Pit[b]	800-1000	301/1200	25.1	34/316	10.8
Miller[c]	ca. 1125	?	33.0	43/163	26.4
Bennett[a]	ca. 1250	44/235	18.7	45/149	30.2
Glen Williams[d]	ca. 1400	1378/5746	24.0	615/2745	22.4
Syers	1300-1500	44/284	15.5	24/84	28.6
Roebuck[e]	1450-1530	?	?	223/739	30.2
QC sauf PR	ca. 1500	97/587	16.5	53/335	15.8
Place Royale	ca. 1500	2/101	1.98	6/75	8.0
Keffer	1500-1575	41/266	15.4	6/59	10.2
Kleinburg[a]	ca. 1600	178/918	19.4	96/283	33.9
Sopher[f]	ca. 1600	14/27[g]	51.8	98/1153	8.5[h]

a Patterson 1979
b Anderson 1968
c Ossenberg 1969
d Hartney 1981
e Knowles 1937
f Noble 1968

g apparement la proportion de mandibles d'adultes dont as moins une dent est tombée avant la mort

h sont incluses les dents déciduales et permanentes. Nous avons utilisé la proportion d'individus adultes (77/92, soit 83.7%) pour estimer le nombere minimum de dents permanentes: 83.7% de 1153, soit 965. Ainsi, au plus 10.1% (98/965) des dents permanentes étaient cariées.

DISCUSSION

Si nous admettons que les différences entre nos échantillons peuvent être généralisées aux populations qu'ils représentent, comment alors pourrions nous expliquer l'existence de telles différences? Bien qu'elles soient fragmentaires et parfois équivoques, nos données biologiques permettent néanmoins de nous ouvrir la voie. Ainsi, tout semble s'être passé comme si les habitants du village de Dawson avaient été plus métissés que ceux du site Mandeville, ou que des individus étrangers à la communauté locale s'y étaient intégrés. Mais nous aimerions aussi savoir pourquoi il semble en avoir été ainsi. Pour ce, nous nous référerons à d'autres données, telles les données archéologiques, ethnohistoriques et environnementales.

Il paraît vraisemblable que la situation géographique de l'île de Montréal à joué un role dans la variabilité biologique que nous y observons. Cette situation privilegiée, au carrefour de deux grandes voies de communication, l'Outaouais et la partie ontarienne du Saint-Laurent, aurait fait converger vers la plaine de Montréal des influences de diverses provenances drainées par ces mêmes cours d'eau, et aurait ainsi favorisé l'assimilation de groupes plus ou moins distincts biologiquement et culturellement. De plus, la présence de rapides autour de l'île à probablement invité ces groupes à adopter ce lieu comme principal centre d'échanges, ou tout au moins comme halte importante. Ce rôle de plaque tournante que l'on prête à la plaine de Montréal transparaîtrait également dans les témoins culturels:

> . . . the existence of a number of artifacts in the Dawson site collections which are foreign to other Iroquoian sites of the St. Lawrence River Valley raises the possibility that the inhabitants engaged in a trade pattern significantly broader than that of the other known Iroquoian sites in the area" (Pendergast 1972: 152).

Ces artefacts témoigneraient de contacts, directs ou indirects, avec les Européens, les Hurons/Pétuns, des populations du lac Supérieur, des Prairies, de la Nouvelle-Angleterre et de la côte de l'Atlantique.

Les crânes mâles au toit exhaussé, au profil arrondi et au volume important pourraient être ceux d'individus ayant de fortes affinites avec ceux d'Algonquins, car ils se conforment peu au type iroquoien. Ils ressemblent d'ailleurs étroitement à des crânes de Montagnais et d'Algonquins auxquels ils ont été comparés. Ces sujets Algonquiens datent cependant de XVIIe siècle, et sont donc probablement – tout comme ceux de Dawson? – des métis. Ces considérations rappellent l'idée reprise par Stern il y a quelque 20 ans, voulant que "Hybridization between different species or breeds of animals or plants results in increased size . . . " (Stern 1960: 299). Ce phénomène, appelé hétérosis, aurait été mis en évidence à la même époque chez l'homme (voir Hulse 1963: 394) et influencerait notamment la stature et les dimensions crâniennes. Stern (1973: 457) a ultérieurement émis des doutes sur de telles conséquences du métissage.

L'originalité de la collection du site Dawson pourrait d'autre part être attribuée en partie à la présence de plus d'un niveau d'occupation en ce site. En effet, Dawson nota que certaines habitations "occur over the burial places, as if one generation had built its huts over the graves of another" (Dawson 1861: 363). Cette remarque appelle une autre interprétation, à savoir que des inhumations eurent lieu à l'intérieur des habitations, comme il fut observé au site Mandeville. Et si le site Dawson avait contenu plusieurs niveaux d'occupation, cela ne serait probablement pas passé inapercu à l'examen des artefacts. Or, Pendergast ne soulève pas cette possibilité.

La situation semble avoir été toute différente au site Mandeville. L'homogénéité qu'on croit y déceler est plutôt compatible avec un groupe impliqué dans un reseau d'échanges génétiques plus restreint que celui des habitants du site Dawson. De plus, les témoins culturels seraient moins diversifiés, mais pas au point de croire que la population de Mandeville vivait dans un état d'isolement relatif (Girouard 1981, communication personnelle). La localisation du village, à une certaine distance de la rive sud du Saint-Laurent, pose quand même le problème de la nature et de l'intensité des relations que ses habitants entretenaient avec les autres groupes de la vallée du Saint-Laurent, d'autant plus qu'au cours de ses voyages de 1535-36 et 1541, Cartier ne signala la présence d'aucun lieu d'habitation sur cette rive du fleuve (voir Biggar 1924). Qui plus est, une longue section de la rive nord, entre Stadaconé et Hochelaga, aurait été inhabitée, du moins par des sédentaires. Le site Mandeville se trouve au niveau de ce "no man's land".

L'isolement apparent de ce site n'est certainement pas imputable à un accident géographique; il serait donc plutôt d'origine culturelle. Vers la fin de l'époque préhistorique tout au moins, les Iroquoiens de Mandeville participaient peut-être plus activement que les autres Iroquoiens du Saint-Laurent, à un réseau de relations centré sur le Richelieu. Mais cette hypothèse rend compte de leurs caractères distinctifs, et non de leur homogénéité.

L'état fragmentaire du matériel de la Place Royale ne permet pas de représenter la variabilité des Iroquoiens les plus septentrionaux. Toutefois, il apparaît qu'ils se distinguaient de tous les autres Iroquoiens au niveau de leur appareil masticateur, dont les caractéristiques sont diagnostiques d'un régime alimentaire axé sur la chasse, la pêche et la cueillette; celles des échantillons de la région de Montréal dénotent une consommation importante de produits de l'agriculture et de l'horticulture. Cette différence de régimes alimentaires est tout à fait compatible avec les témoignages de Cartier, sur lesquels on peut se fier pour reconstituer, en gros, l'alimentation aux sites de la Place Royale et Dawson, pourvu qu'ils aient été à peu près contemporains des villages de Stadaconé et d'Hochelaga, ce qui ne fait guère de doute. Mais Cartier laisse aussi entendre que les Stadaconiens étaient également des agriculteurs et que les Hochelaguiens pratiquaient la pêche. La différence dans les régimes alimentaires est donc plus quantitative que qualitative, et s'expliquerait par une différence de climat, que résume très bien le nombre de degrés-jours de croissance par an [4]: 1585 à Québec, 2053 à Montréal (Hare et Thomas 1974). Plusieurs chroniqueurs avaient d'ailleurs souligné les écarts de température entre Montréal et Québec; Boucher précisait même, en 1664, que l'hiver est plus court d'un mois et demi à Montréal (Société Historique de Boucherville 1964: 20).

Le taux de caries dentaires est particulièrement sensible à des régimes alimentaires distincts. Il est généralement reconnu qu'il est plus faible chez des chasseurs-cueilleurs que chez des agriculteurs (voir Turner 1979). Clermont (1978) avait déja proposé, sur la base des taux de caries et de chutes *ante mortem*, que les Iroquoiens de la Place Royale avaient une économie de subsistance mixte moins liée à l'agriculture que celle des habitants de la région de Montréal. Nos propres données concordent avec cette assertion.

A notre avis, les différences environnementales n'auraient pas qu'engendré des différences dans les modes de subsistance et les phénotypes. Plus généralement, nous pensons qu'elles auraient été à l'origine de complexes adaptatifs variés, celui des Iroquoiens de la Place Royale étant modelé sur un environnement au climat plus rigoureux et moins favorable à l'agriculture que celui dans lequel évoluaient les habitants du sud du Québec. Leur adaptation particulière aurait touché, outre les modes de subsistance et les phénotypes, la culture matérielle, l'organisation sociale, les relations intergroupes, les schèmes d'établissement, etc.

L'accomplissement d'activités de subsistance distinctes n'empêche évidemment pas le maintien de relations étroites entre deux groupes, mais favorise une polarisation des relations. Ainsi, les Iroquoiens de la région de Québec ont probablement été amenés à entretenir des contacts plus étroits et plus fréquents avec des groupes nomades que ne l'ont été ceux du sud du Québec. Les récits de Cartier invitent fortement à croire que Stadaconiens et Hochelaguiens entretenaient des liens fort différents avec les populations de l'arrière-pays, voire qu'ils étaient hostiles les uns envers les autres. L'apparente absence d'établissements permanents sur une longue portion du fleuve, entre Stadaconé et Hochelaga, pourrait traduire cette présumée polarisation. D'autre part, la présence d'un site d'occupation iroquoien près de l'embouchure du Saguenay, à environ 200 km au nord de Québec, pourrait bien représenter "un lieu de rencontre privilégié entre deux nations alliées [les agriculteurs-pêcheurs de la région de Québec et les nomades de la forêt boréale]" (Chapdelaine 1984: 32).

La différenciation des complexes adaptatifs se serait amorcée, pensons-nous, avec l'avènement de l'agriculture dans la vallée du Saint-Laurent. En effet, c'est essentiellement à travers les modes de subsistance que se serait exprimée l'action différenciatrice de l'environnement. Or, il est très probable que l'introduction de l'agriculture engendra une différenciation graduelle des modes de subsistance qui, auparavant, étaient homogenes. Ces considérations évoquent le problème de la situation septentrionale des Stadaconiens: leurs ancêtres occupaient-ils la région de Québec avant le début de l'agriculture dans la vallée, ou étaient-ils les descendants d'agriculteurs venus du sud? Dans la dernière éventualité, leur localisation pourrait représenter l'expansion maximale permise à des agriculteurs.

Les individus de Westmount sont difficiles à situer par rapport aux autres collections du Québec; ils auraient plus d'affinités tantôt avec les uns, tantôt avec les autres. Leur taux de caries dentaires est comparable à celui d'une population d'agriculteurs. S'ils sont un échantillon d'Iroquoiens de la fin du Sylvicole, comme le pense Trigger, alors ils contribueraient à accentuer la variabilité dans la plaine de Montréal que nous avions estimée à l'aide des sujets de Dawson. Mais si ces derniers sont plus récents, ce qui est probable car aucun objet de facture européenne n'a été trouvé dans les sépultures de Westmount décrites par Lighthall, alors nous pouvons supposer que l'hétérogénéité biologique était un fait récent sur l'île de Montréal et pourrait résulter de l'arrivée des Européens. Dès lors, les anciens réseaux d'échanges commerciaux auraient été modifiés et, en conséquence, la composition biologique de ses habitants. Les gens de Mandeville, où aucun objet européen n'a été mis au jour, ont pu, tout comme ceux de Westmount, être soustraits aux influences européennes. Ils incarneraient, eux aussi, la variabilité biologique dans la plaine de Montréal, avant que la venue des Européens contribue à l'accentuer.

Nous croyons que, même sans la présence intermittente des Européens durant le XVIe siècle, le fleuve lui-même aurait favorisé la différenciation des groupes humains qui occupaient ses rives, et cela de deux facons. D'abord, son orientation vers le nord-est dut susciter une différenciation culturelle et phénotypique de groupes exploitant des milieux différents, ce qui est certainement moins le cas selon un axe est-ouest par exemple, le long duquel les variations climatiques sont généralement moins accentuées car elles dépendent de facteurs autres que la latitude. Puis, cette différenciation initiale aurait donné lieu à une autre source de divergence, à savoir l'établissement, par les communautés des régions de Montréal et de Québec tout au moins, de relations avec des groupes humains distincts. Cette dernière cause de variation à pu s'exprimer notamment par le développement de patrimoines génétiques différents. Le commerce avec les Européens à très probablement renforcé la polarisation autour des deux centres et mis davantage en valeur la situation privilégiée de l'île de Montréal.

La comparaison entre l'ensemble des mâles de l'Ontario et celui du Québec à donné des résultats assez inattendus: la grande variabilité des sujets de l'Ontario et, en consequence, la variabilité relativement réduite de ceux du Québec. Nous devons surtout chercher du côte de la collection Syers pour expliquer ce fait, car elle est nettement plus hétérogène que celle de Keffer.

Rappelons que Webb (1972) arriva à des résultats concordant avec une hétérogénéité marquée chez les mâles de Syers, et que Knowles, sur la base d'autres données, avait suggéré qu'ils étaient métissés (Knowles 1937: 51). Mais il faut également considérer la possibilité que les coutumes funéraires ont pu influencer la composition biologique de cet ossuaire (comme celle d'ailleurs de tout échantillon de squelettes). Nous ne savons pas par exemple si l'ensemble des personnes inhumées dans un ossuaire correspond ou pas à une entité sociale et/ou biologique précise, ou si un individu à été inhumé dans son village natal ou son village adoptif. Et les prescriptions qui présidaient au lieu d'inhumation d'un individu etaient-elles les mêmes dans toute l'Iroquoisie, et ont-elles changé avec le temps?

Il est également tentant de voir dans la plus grande variabilité des mâles de l'Ontario, par rapport à ceux du Québec, une pratique plus généralisée de l'uxorilocalité chez les premiers que chez les seconds. Rappelons que cette règle de résidence post-matrimoniale stipule que le nouveau couple habitera dans le village de la femme; ainsi, les femmes d'un même village seront plus apparentées entre elles que ne le seront les hommes entre eux, d'ou' une hétérogénéité plus marquée chez ces derniers. Nous avons effectivement noté que les mâles de l'Ontario sont plus variables que les femelles, alors que tel ne serait pas le cas parmi les Iroquoiens du Québec. La pratique d'une agriculture plus intensive en Ontario, qui en outre s'y implanta plus tôt qu'au Québec, vient étayer notre hypothèse, pourvu que l'on reconnaisse l'existence d'un lien entre l'adoption de l'agriculture d'une part, et la matrilinéarité et l'uxorilocalité d'autre part (Trigger 1969: 56). Le milieu physique serait donc toujours en cause: vu l'abondance des ressources naturelles dans la vallée du Saint-Laurent, soulignée avec force par Cartier notamment (voir Biggar 1924), et des conditions climatiques moins propices à l'agriculture, les Iroquoiens du Saint-Laurent (ou certains d'entre eux) auraient adopté plus tardivement que ceux de l'Ontario, l'agriculture et les structures sociales qui lui seraient associées.

D'autre part, des analyses de variance (dont les résultats ne sont pas présentés ici) révèlent que pour près du tiers des variables celles de la mandibule étant exclues les mâles de Keffer, de Syers et l'ensemble de ceux du Québec ont des moyennes significativement dissemblables, à $p \leq 0.05$ ou mieux. En outre, les fréquences des caractères non-métriques (tableau 7) indiqueraient que les mâles du Québec ont moins d'affinités avec ceux de l'Ontario que les deux groupes de l'Ontario n'en auraient entre eux.

Après avoir exposé l'ensemble de nos observations, nous sommes amenés à douter que les "St. Lawrence Iroquois potters, not just the pots, appear to be distributed throughout the Ontario villages of southcentral Ontario and Huronia". Cette affirmation qui, pen sons-nous, reflète assez bien la perception de nombreux préhistoriens de l'Ontario, demande à tout le moins à être nuancée.

Sans aller jusqu'à croire que l'ensemble des Iroquoiens du Québec et de l'Ontario constituait aux yeux de nos collègues ontariens une population panmictique, nous pensons, contrairement à eux semble-t-il, que l'Iroquoisie était passablement morcelée culturellement et biologiquement. Nous l'imaginons constituée de plusieurs réseaux régionaux d'échanges génétiques, eux-mêmes constitués de réseaux locaux. Ces derniers auraient déployé leurs influences essentiellement, mais non exclusivement, à l'intérieur de leurs propres réseaux régionaux. La vallée du Saint-Laurent aurait été un de ces réseaux régionaux, composé d'au moins deux réseaux locaux, celui centré sur Montréal et l'autre sur Québec. Mais tout comme un champ gravitationnel, les aires d'influence de ces réseaux n'ont pas de frontières proprement dites et exercent donc théoriquement leur action jusqu'à l'infini. Il est donc évident qu'une aire d'influence génétique devait recouper à des degrés divers toutes les autres aires. Mais nous croyons que l'intensité des "champs génétiques" s'estompait assez rapidement, que ces champs s'évanouissaient dans l'espace plus tôt qu'on ne le croyait. Tout semble s'être passe comme dans les pays où l'identité régionale prime sur l'identité nationale. Les préhistoriens ontariens admettent certainement l'existence de différences interrégionales, mais pour eux elles semblent très mineures: les Iroquoiens auraient été plus nationalistes que régionalistes. La différence entre notre perception et la leur n'est probablement qu'une question de degré, mais elle est néanmoins chargée de signification.

Les groupes iroquoiens de la fin du Sylvicole à tout le moins jouissaient probablement d'une grande autonomie, qui leur aurait été conferée notamment par l'abondance des ressources alimentaires. Mais l'abondance relative de certaines ressources aurait variée d'une région à l'autre. Par exemple, au début du XVIIe siècle, les orignaux étaient rares en Huronie mais abondaient dans la Province de Canada (Sagard 1976: 218). Ce fait dut favoriser un état de dépendance, chez les Hurons, à l'égard des produits agricoles, état qui fut permis par des conditions climatiques favorables. La situation était inverse à l'extrémité septentrionale de l'Iroquoisie, et intermediaire dans la plaine de Montréal. Cette réaction en cascade se reflèterait dans la variation des taux de caries dentaires. Le tableau 9 montre que des 1125 ap. J.C., les taux de caries étaient déjà très élevés en Ontario. Pour rendre compte de la variation observée entre Iroquoiens du Québec et de l'Ontario, il paraît donc raisonnable de proposer un scénario semblable à celui imaginé pour expliquer la variabilité parmi ceux du Québec seuls : des différences dans l'environnement aurait engendré une différenciation phénotypique et culturelle, laquelle aurait ultérieurement donne lieu à une différenciation génotypique.

Il demeure toutefois évident que l'ensemble des Iroquoiens se distinguaient, sur le plan biologique, de celui des Algonquiens dont ils étaient entourés de toute part. Mais cette entité biologique iroquoienne n'aurait pas eu l' homogénéité qu'on lui prête généralement. A la vue d'une variabilité réduite ou importante, d'un faible ou fort taux de caries, de boîtes crâniennes aux dimensions et aux formes peu usuelles, on se dirait en présence d'autant d'originalités locales. Webb croit que " ...the Ontario Iroquois will...be found to be made of biologically dissimilar groups, even in the presence of cultural similarities" (Webb 1972: 132). Cette assertion, pensons-nous, pourrait être élargie à l'ensemble des Iroquoiens.

CONCLUSION

Bien que l'état fragmentaire et la petitesse de nos échantillons confèrent à notre interprétation des faits un caractère provisoire, nous estimons qu'il y a matière à remettre en question l'assimilation biologique des Iroquoiens du Saint-Laurent à ceux de l'Ontario. La non-représentativité des squelettes d'Iroquoiens du Saint-Laurent, qui avaient jusqu'à tout récemment servi à élaborer une représentation de leurs affinités biologiques par rapport à d'autres Iroquoiens, serait en bonne partie à l'origine de cette remise en question. Nos analyses laissent en outre entrevoir des différences appreciables au sein même des Iroquoiens du Saint-Laurent.

L'un des facteurs qui à certainement contribué à la différenciation inter- et intra-régionale est le milieu physique. D'autres facteurs, telles les règles de résidence post-matrimoniale et les prescriptions funéraires, ont pu en partie déterminer la composition biologique des échantillons étudiés. Mais il est prématuré d'etablir la contribution de chacun de ces facteurs, tant à cause des problèmes indéniables de représentativité et des méthodes élémentaires d'analyse – les uns n'allant pas sans les autres – qu'à cause de nos connaissances lacunaires des coutumes des Iroquoiens.

Nous avons essentiellement voulu nous baser sur des restes humains pour élaborer un modèle général relatif à l'adaptation bioculturelle de divers groupes iroquoiens. Ce modèle, nous le voulions compatible avec d'autres données que celles purement biologiques. Il est à espérer que ce modèle puisse être éprouvé, et ce dans des conditions meilleures que celles qui prévalent actuellement. Il serait particulierement souhaitable que les collections québécoises s'enrichissent de nombreux autres spécimens, et que les femelles soient mieux représentées qu'elles ne le sont ici. Et si les recherches futures remettent en question notre modèle, alors nous osons espérer qu'il aura néanmoins contribué à améliorer nos connaissances de la préhistoire des Iroquoiens.

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NOTES

1. Ce texte est une version condensée de notre mémoire de maîtise (Larogue 1982).
2. Jusqu'à ce jour, les seuls Iroquoiens du Saint Laurent qui ont été systématiquement comparés à d'autres Iroquoiens sont ceux du site Roebuck, situé dans la portion ontarienne du Saint-Laurent.
3. Le lecteur trouvera dans l'ouvrage de Pendergast et Trigger (1972) une analyse détaillée de cette question.
4. Le nombre de degrés-jours de croissance d'une journée est égal au nombre de degrés par lequel la température moyenne du jour exède une température de base de 42° F. (5.5° C).

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BAND STRUCTURE AND INTERACTION IN EARLY SOUTHERN ONTARIO

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Abstract: Though osteologists and archaeologists have enjoyed a long and fruitful association in Ontario, their collaborative efforts have focussed largely on defining the evolution and external relationships of societies. Internal structure (demography, post-marital residential practises, status variation, etc.) has received much less attention, despite its effect on a society's relationships in time and space. A proper internal analysis involves careful correlation of archaeological and osteological data, with special emphasis on the distribution of osteological traits within the community. If samples are adequate, coefficients of similarity can be constructed to measure individual relationships.

Internal analyses of Archaic and Early Woodland samples point to small hunter-gatherer bands with no consistent post-marital residential practises and with status systems based on age, sex, and personal achievement. The appearance of specialized cemetery areas in the Terminal Archaic (if not before) suggests the presence of new social pressures, but their precise nature is not known. Though cemeteries are usually thought to reflect descent-based territorial claims aimed at external groups, the relatively small and dispersed population of Ontario at this time should not have led to inter-band competition for resources. More probably the cemeteries, and the rituals that took place in them, helped to maintain stability and organization within the macroband. In the Rice Lake area during the Middle Woodland period, however, larger bands developed that may have placed some strain on local resources. Mound burial, patrilocal residence, and a system of inherited rank were probably responses to this situation, with the mounds symbolizing a band's claim to a particular territory. In order to properly investigate such possibilities, though, osteologists must treat each skeletal series as an internally variable sample, to be analyzed along a variety of dimensions (age, sex, status, location, treatment, etc.).

Résumé: Quoique les ostéologues et les archéologues aient profité d'une longue association dans l'Ontario ils ont dirigé leurs efforts réunis surtout sur la définition de l'évolution et des relations extérieures des sociétés. La structure d'intérieur (la démographie, les habitudes en ce quir concerne la demeure après les noces, la variation selon le rang social, etc.) a recu beaucoup moins d'attention malgré son influence sur les relations d'une société dans le temps et l'espace. Pour faire une véritable analyse d'intérieur il faut de la corrélation soigneuse des données archéologiques et ostéologiques et il faut souligner en particulier la distribution des traits ostéologiques dans la société. S'il y a assez d'échantillons on peut établir des facteurs de rapprochement pour mesurer les relations individuelles.

Les analyses d'intérieur des échantillons des Archaiques et des Woodlands dans l'Ancien Temps indiquent de petites bandes de chasseurs et ramasseurs qui n'avaient pas d'habitudes particulières concernant la demeure après le mariage et qui avaient des systèmes de statut basés sur l'âge, le sexe, et les accomplissements personnels. La découverte des cimetières particuliers dans l'Archaique terminal (sinon avant ce temps) suggère qu'il y avait de nouvelles contraintes sociales mais on n'est pas certain de leur caractère précis. D'habitude les cimetières ne sont que le reflet des droits territoriaux basés sur la descendance et dirigés à certains groupes externels; pourtant, la population assez petite et éparpillée de l'Ontario à cette époque n'a pas dû conduire à la rivalité des bandes pour ressources. Il est plus probable que les cimetières et les cérémonies qui y ont eu lieu, ont contribué à maintenir de la stabilité et de l'organisation à l'intérieur de la macrobande. Dans la région de Rice Lake pendant l'époque du Moyen Woodland, pourtant, la population des bandes s'est grandie et cet évenement pouvait produire de la tension des ressources locales. Il est fort possible que, comme résultat de cette situation, des tumulus, de l'habitation patrilocale, et un système de rang basésur la succession se sont manifestés, en ce cas, les tumulus auraient le rôle symbolique du droit d'une bande à un certain territoire. Pour bien étudier ces possibilités, les ostéologues doivent considérer chaque suite squelettique comme un exemple internellement variable à être analysé selon une variété de catégories (âge, sexe, rang, emplacement, traitement, etc.).

Keywords: **Band Structure, societal rules, osteology, Ontario**

INTRODUCTION

Ontario has a long-established tradition of cooperation between osteologists and archaeologists, arising largely from the work of James E. Anderson (c.f. Wright and Anderson, 1963; Anderson, 1968). However, these collaborations have generally mirrored the principal concern of archaeologists, the external relationships of sites and cultures in time and space. Skeletal series have been treated largely as undifferentiated units to be used in comparative analyses. In the Serpent Mounds monograph, for example, Anderson (1968) demonstrated biological continuity between Middle and Late Woodland populations by lumping the various samples from the site (3 mounds and 3 ossuary pits) into two major contrasting categories, as did Molto (1983) some years later. Very few Ontario osteology reports have presented individual rosters of discrete traits, metric data and pathology (for a welcome exception see Melbye, 1983).

Though necessary for comparative analyses, this generalized approach is inadequate for a detailed study of the internal structure of a community. For that matter, to properly evaluate even the external relationships of a group we must have some idea of how the group itself is organized - its size, demographic structure, status variation, and post-marital residential practices. For example, the biological distance measurements generally used to define inter-group relationships may not be entirely suitable for the analysis of relatively small, fluid, hunter-gatherer bands. Quite apart from the usual problems of small sample size and poor preservation, there are questions about the effects of band size and organization on the genetic structure of the group and on its relationships with neighbouring bands. A small band may not have a highly consistent morphological pattern. Close biological relationships among band members can lead to unusually high or low proportions of some traits in the group, proportions that could change radically in the space of a few generations because of the enhanced effect of genetic drift on such small bands (Molto, 1983:247). The result, rapid and somewhat erratic change in a group's trait profile, could confound efforts to relate it osteologically to antecedent and descendent series from the same locality. This may account in part for the irregularities in some of the distance measurements based on the two Donaldson site cemeteries (Molto, 1979b:45).

Biological distances from neighbouring contemporaneous groups may also be affected, inflated to some degree by the exaggerated incidences of some traits in one or the other series. Offsetting this, though, would be the high level of gene flow. Small, widely spaced bands require both a high degree of exogamy and a broad area for mate selection if they are to maintain a demographically viable population (Wobst, 1974; Pfeiffer, 1977:270). Such mating networks would be relatively open ended, leading to gradual geographic clines in traits (Meiklejohn, 1974). Still, in practise it may be difficult to identify gene flow if one is dealing with small samples and relativley uncommon traits.

Post-marital residential practises will also have an impact on band trait profiles. In a situation in which no particular practise prevails, each couple responding flexibly to shifting social and environmental pressures (Lee and DeVore, 1968:8-9), the levelling effect of gene flow on localized gene pools would be maintained. On the other hand, a tendency toward the co-residence of related males or females might increase the incidence of particular traits in a series, perhaps providing more trans-generational continuity in th group's trait profile. This would offset somewhat the regional homogeneity created by gene flow, while at the same time decreasing the biological distance between successive series in the same locality (Buikstra, 1980:288-289,295-297).

In any event, it is clear that with small hunter-gatherer bands biological distance measurements, where samples are large enough to permit them, are not going to be straightforward expressions of a group's relationships with others in time or space. They will require careful interpretation, with full consideration of the social and demographic structure of the groups involved. One important component of such an interpretation will be the distribution in time and space of traits of particular significance (Molto, 1979a, 1979b:36-37, 1983:228, 240-241). Their distribution within the series, particularly along the dimensions of sex and status, will be equally important.

Osteologists must confront these questions in their analyses and reports. For their part, archaeologists must consider several points when excavating burials. They should determine, if at all possible, the season of interrment (Rothschild, 1979), the relationship of each burial in time and space to the others in the site, the number and spacing of occasions on which a particular burial feature was used, the degree to which each burial was primary or secondary, position and orientation, the function of apparently empty pits, etc. Reconstruction of the burial programme will only be successful if the archaeological work has been done with the sort of care and attention to detail that makes the discovery of a burial an occasion for despair to most archaeologists.

Beyond the numerous technical problems with this whole process, there are a couple of deeper pitfalls. One, discussed in many reports, is the possibility that rules of exclusion, or simple indifference, may channel particular kinds of individuals away from burial in the community cemetery (e.g. Buikstra, 1981; Knight and Melbye, 1983). Infants and young children often seem to be under-represented (c.f. Buikstra, 1976: 22-23). Perhaps in some societies there was less concern with retaining for cemetery burial the bodies of sub-adults who die at a point in the group's seasonal cycle distant from the communal burial ground. Also infants who died before being formally assigned a social identity (usually done in a naming ceremony within a few weeks of birth) may have been disposed of rather casually.

Another problem, less generally recognized, arises from localized variations in mortuary practises (c.f. Spence, Finlayson, and Pihl, 1979:119). A burial pattern defined at one site cannot be assumed automatically to apply to others in the region, even though they all share the same archaeologically defined culture. Cremation at the Hind and Picton sites, for example, varies by age despite the fact that both are assigned to the Glacial Kame complex (Pfeiffer, 1977:35-40, 131-143; Ritchie, 1949:24-45).

METHODS AND ASSUMPTIONS

In the following pages these questions will be discussed with reference to Archaic, Early Woodland and Middle Woodland skeletal series from southern Ontario (see Figure 1). Summaries with more detailed consideration of the archaeological data have been presented elsewhere (Spence, Finlayson, and Pihl, 1979; Spence and Fox, 1983; Spence and Pihl, 1984; Spence, Pihl, and Molto, 1984). During these periods southern Ontario was occupied by hunters and gatherers. Where we have adequate evidence, there bands seem to have followed a pat-

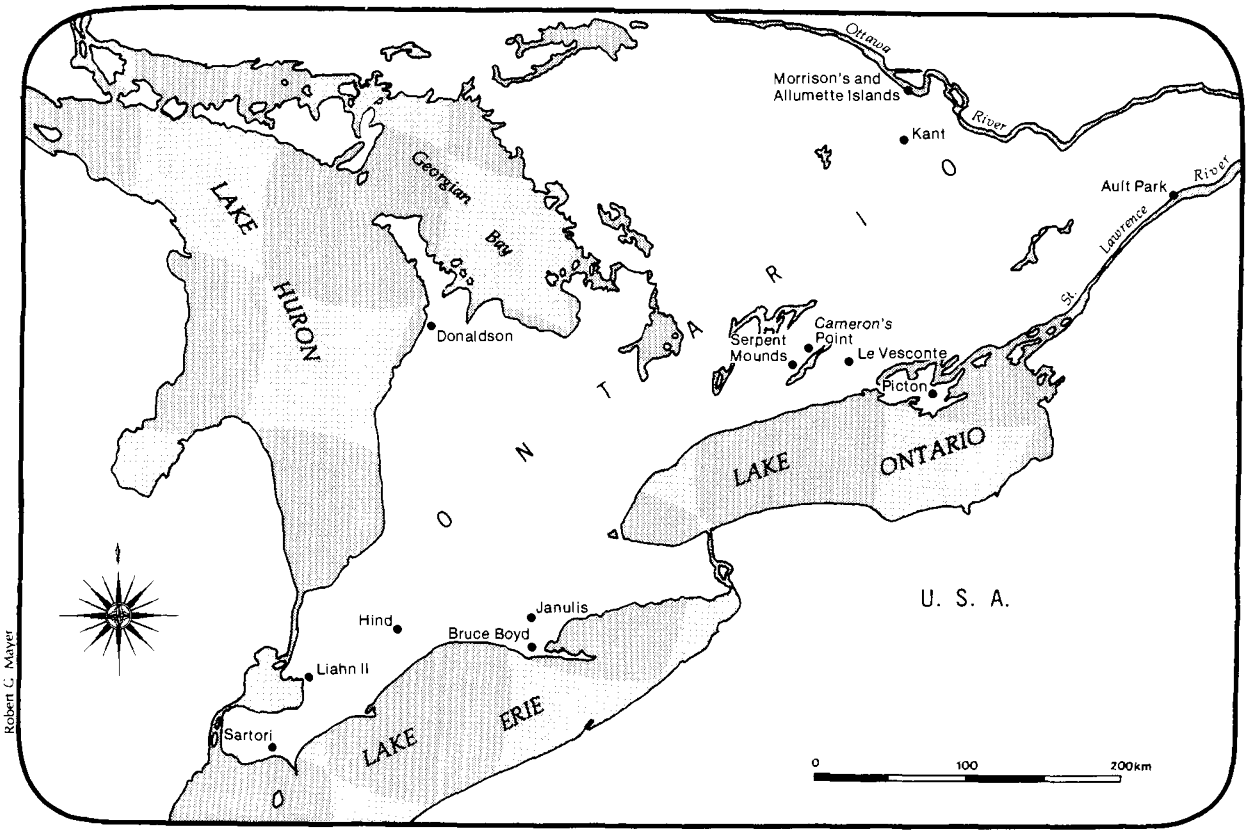

Figure 1.

tern of seasonal movement within a circumscribed territory, with spring agglomeration into a macroband of variable duration followed by dispersal into a number of microbands, each consisting of a few related families that wintered together (Wright and Anderson 1963; Finlayson, 1977; Kenyon, 1980). Although the majority of deaths would have occurred over the winter, when the weather was harshest and the food supply lowest, final burial was probably delayed until the ground had thawed, perhaps until the macroband had gathered once again in the spring.

Mortality would have varied over this long time span and wide area, but perhaps the crude death rate of 3.4% per year suggested by Buikstra's data (1976:25) can be used as a general measure. It is based on Middle Woodland groups in the Illinois River Valley, hunter-gatherers adapted to a northern climate not unlike that of Ontario. The later Uxbridge ossuary series indicates a crude death rate of 4.0% per year (Pfeiffer, 1983:10), but there may have been a rise in mortality with dependence on agriculture (c.f. Buikstra, 1977:77-78).

A number of approaches have been developed for the reconstruction of social organization. Archaeologists have been particularly ingenious in their use of burial patterns (c.f. Tainter, 1978; Trubowitz, 1977; King, 1978; Brown, 1979; Goldstein, 1981), but have inexplicably neglected osteological data despite the exellent examples offered by Buikstra (1976; 1980), Land and Sublett (1972), Kennedy (1981), and others. Where skeletal samples are large enough, statistical techniques can be applied productively (c.f. Lane and Sublett, 1972; Buikstra, 1980:291-294; Kennedy, 1981). More often, however, hunter-gatherer series are quite small. Analyses of internal structure must then be conducted through somewhat less precise methods.

Occasionally a rare trait is present and distributed in such a way that biological relationships within the series are clearly reflected (Molto, 1979a). Generally, though, the evidence is less straightforward. Often some traits will have unexpectedly high frequencies in series, suggesting that their incidences may have been inflated by close genetic links. Their distributions by age or status within the series might then offer some insight into the group's organization. Caution is required here, though. Variations of this sort can be expected to arise by chance from time to time, regardless of the social context.

A third, somewhat more complex procedure involves individual to individual comparisons in terms of a roster of carefully selected discrete traits, in order to obtain a measure of the degree of similarity between each two individuals in the series (Spence, 1974). The sum of these measures then provides an expression of the morphological homogeneity of the group, or of some segment of it. Specifically, each pair of individuals is compared trait by trait. If a trait is shared by the two, a positive match is scored. A negative match indicates the absence of the trait in both individuals, while a non-match indicates the trait is present in one but absent in the other.

Where possible, matching sides are compared. For example, if individual A has trait b present on the left but absent on the right while in individual B it is present on the right but the left side is destroyed, the score would be one positive match as individual A's left side and individual B's right side are compared.

The result of each pair comparison is a coefficient in which the numerator consists of all the matches, positive and negative, between the two individuals while the denominator includes all matches and the non-matches. This "coefficient of morphological similarity" is thus a ratio of the actual to the potential number of trait matches between the two individuals. The degree of homogeneity within the group (or within some segment, e.g. all males or all high status individuals) can then be expressed by the ratio of all matches to all potential matches in the group as a whole. In another variant of this procedure, used with Mexican material, negative matches were not included (Spence, 1974).

There are, of course, a number of problems with this method. The most fundamental one is the difficulty that plagues all hunter-gatherer analyses. The samples are small, so no matter how many traits are used the foundation may still be inadequate. Beyond that, there is the problem of determining which traits show an unacceptable sex bias or correlation. Buikstra (1980:296) and Molto (n.d.) have pointed out that the roster of such traits changes from population to population, and should be tested anew each time with statistically viable samples. However, in the absence of sufficient data I shall adopt Molto's (1983; n.d.) recommendations, based on Iroquoian data.

It should also be emphasized that coefficients calculated for one series cannot be directly compared to those of another, since each series will have different trait incidences. In fact, I have not even used the same roster of traits for each series examined here. Also, the general incidences of some of the traits differ radically. Supraorbital foramina, for example, rarely fall below 50% while accessory mental foramina rarely surpass 5%. If one or the other of these traits were unobservable due to loss or destruction in one of the individuals, it could have a noticeable impact on the comparison. More to the point, the impact would vary with the trait lost.

Despite these drawbacks, the coefficient does offer us some measure of the degree of overall morphological similarity among the members of a group. If the traits have a genetic basis, as most writers believe (Berry and Berry, 1967), then the coefficient may be considered an expression of the degree of genetic homogeneity within the group. It is evident that it still leaves a lot to be desired. Even the selection of traits for use is problematic. If some with a low heritability are included, their distribution may reflect environmental rather than genetic factors (Molto, pers. com.). However, the technique will have to do until either better measures are devised or larger samples are obtained.

LATE AND TERMINAL ARCHAIC

The paucity of Late Archaic (3000-1400 B.C.) burials in southern Ontario is partially due to the small size and wide spacing of bands at that time, but the abscence of formal cemeteries may be a factor too. The Morrison's Island and Allumette Island series are the largest samples (Figure 1; Kennedy, 1966; Pfeiffer, 1977:23-32). Here a number of individuals were found in closely spaced, sometimes overlapping graves. Thirteen of the eighteen Morrison's Island burials were primary, indicating a general practice of burial at or near the time of death. The presence of occupation debris interspersed among the graves suggests that the area may not have been a true cemetery; rather, burial may have taken place near the residence in a small repeatedly occupied site (Kennedy, pers. com.). The same is probably true of the Frontenac Island site in New York, where numerous burials were intermixed with occupation debris on a small island (Ritchie, 1945). At the Janulis site in southwestern Ontario (Figure 1), the burial of an adult female had been intruded upon the earlier burial of two males at the edge of the occupation area. Further testing and land levelling operations in the vicinity revealed no other graves.

In contrast, a number of Terminal Archaic (1400-900 B.C.) burials have been located across the province. This reflects in part the presence of true cemeteries, areas set aside solely for the burial of band members and used repeatedly over the years. Another factor is the frequent use of exotic grave goods, giving these burials a visibility that the generally less spectacular Late Archaic burials lack.

The Haldimand complex (ca. 1300 B.C.) of the Bruce Boyd site (Figure 1) may be the earliest Terminal Archaic cemetery yet identified in Ontario. Three poorly preserved burials and a ritual cache of artifacts have been assigned to the complex. The burials are accompanied by small bifacials, iron pyrites, copper beads, and red ochre. None were cremated. Each grave held only one individual. However, two individuals, an adult and a child, had offerings of small bifacials so similar in style, dimensions, and material that they were probably made as a set by the same knapper. If so, band members who were buried at the same time were interred in separate graves, rather than being placed together as a multiple burial. the distribution of grave goods suggests a society without ascribed rank.

The Glacial Kame complex (1200-900 B.C.) is characterized by cemetery burial with a variety of grave goods: paired copper celts, "nugget" copper beads, beads and pendants of marine shell, bar birdstones, "cloudblower" pipes, corner-notched bifacials, etc., (Cunningham, 1948; Converse, 1981). Although a number of Glacial Kame sites have been identified in southern Ontario, only a few have been excavated carefully enough to provide useful data.

Graves in Glacial Kame cemeteries usually hold a single individual, but may contain as many as seven (Pfeiffer, 1977:37). When the numbers of individuals and graves from several Ontario sites are totalled, an average of 1.54 individuals per grave is indicated. The two better known cemeteries, Hind and Picton (Figure 1), give averages of 1.76 and 1.30 respectively. The best data are from the Hind site, where the six multiple burials (Pfeiffer, 1977:35-40, 131-143) were:

1. burials 15,15A — an uncremated juvenile of 14 years and a cremated adult male.
2. burials 18,18A,18B — a cremated adult female, an uncremated female of 17-20 years, and a cremated individual (sex unknown) of 18-25 years.
3. burial 7 — the cremated remains of: 5 adults, a child of 7 years, and a juvenile of 12-16 years.
4. burials 2-4 — an uncremated child, an uncremated young adult female, and a cremated female of 17-20 years.
5. burials 9,10 — the uncremated remains of a middle age male and a young adult female.
6. burial 12 — an uncremated probable adult and child.

Burial probably took place annually, with the movement of the band to the spring macroband site. The question is then the identity of individuals sharing a grave. They may have been members, who had died over the preceding year, of the same nuclear family, of the same microband (the few families that wintered together), or of the same macroband. The Hind site multiple graves, particularly burials 7 and 18, seem unlikely to represent the annual dead of only a family or microband, but are about what would be expected of a macroband.

Applying the 3.4% crude death rate and the average of 1.54 individuals per grave, a band size of about 45 is suggested. This figure may actually be a bit low. There may well have been occasional deaths over the late spring and summer, with immediate burial in a separate pit, leading to an underestimate of the number of annual deaths. Also, infants and younger children seem underrepresented in the cemeteries. Even at Hind, where preservation is good, they are considerably outnumbered by adults and older sub-adults (Pfeiffer, 1977). Infant burials are particularly rare; only two, one each from Hind and Picton, are known. Still, the distortion from these sources may not be too serious. Most deaths would have occurred over the winter, and Buikstra's crude death rates are also based on series in which infants are underrepresented (Buikstra, 1976:22-24). Hopefully, further analyses will lead to greater accuracy in fixing crude death rates and identifying missing or underrepresented segments of the population, so band size estimates of this sort can be made with more confidence.

Pfeiffer (1977:143) suggests that cremation took place when some time and/or distance intervened between death and cemetery burial. The Hind side data support this interpretation. Uncremated burials there are generally primary, indicating their death shortly before interment. However, not all sites show the same pattern. At Hind, for example, cremation shows no age bias (Pfeiffer, 1977:35). At Picton, on the other hand, it was clearly biased toward adults. Of those individuals there for whom we have adequate data, 10 (9 adults and 1 of uncertain age) were cremated while 6 (4 sub-adults, 1 juvenile or young adult female, and 1 adult male) were not (Wintemberg, 1928; Ritchie, 1949; Pfeiffer, 1977:33-34). At Sartori, a Glacial Kame site near Leamington (Figure 1), the recovered skeletal material indicates that 3 adults were cremated while 4 adults and 1 juvenile were not, a pattern not unlike Hind (Pegg and Pfeiffer, 1982). The variations in cremation age profiles may then reflect east-west regional differences in Ontario, though these may in turn be due to variations in the seasonal settlement cycle (see below). More data are necessary if these questions are to be resolved.

Although the small size of Glacial Kame bands must have made exogamy the dominant form of marriage, there is no evidence of a preferred post-marital residential practice. Two adult females from Sartori share some discrete traits (absence of parietal foramina, presence of mylohyoid arches), but differ in others (presence of accessory mental foramina, direction of superior sagittal venous sinus, division of hypoglossal canal). Neither seems more nor less closely related to the other than to the adult male from the site (Pegg and Pfeiffer, 1982). Three Hind site individuals have ossified thyroid cartilage, possibly a hereditary trait (Pfeiffer, 1977:36), but these include one female and two males (one of whom, burial 19, is a Late Woodland intrusion — Fox, pers. com.). Two males have ossified apical ligaments, but this trait generally shows a

TABLE 1
Coefficients of Morphological Similarity

	male	female	intersex	total
HIND				
No. of comparisons	3	15	18	36
coefficients	47/77	189/286	267/401	503/764
as percentages	61.0	66.1	66.5	65.8
DONALDSON 1				
No. of comparisons	1	1	4	6
coefficients	14/17	9/12	13/40	36/69
as percentages	82.4	75.0	32.4	52.2
DONALDSON 2				
No. of comparisons	6	1	8	15
coefficients	44/73	8/16	62/100	114/189
as percentages	60.3	50.0	62.0	60.3

male bias (Molto, 1983:150). The incidences of pterygo-basal and pterygo-spinous spurs and bridges seem high, 14/15 and 10/15 respectively, but they occur in both sexes. Mylohyoid bridges are also rather common (5/16), but again seem as apt to occur in one sex as in the other.

With data supplied by Susan Pfeiffer, coefficients of morphological similarity based on 16 cranial and mandibular discrete traits were calculated for six males and three females from the Hind site series (Table 1). The cumulative coefficients for each sex, and for inter-sex comparisons, are similar enough to suggest little or no sex difference in the degree of genetic homogeneity. This supports the evidence of particular discrete traits, indicating the absence of a consistent post-marital residential practice. There is nothing especially surprising about this; small and unspecialized hunter-gatherer societies tend to maintain a high degree of flexibility and inter-band mobility (Lee and DeVore, 1968:8-9).

There are individual variations in the abundance of grave goods at both Hind and Picton, but these variations are not correlated with the differences in burial location or treatment that would be expected in a system of inherited rank (King, 1978). Two individuals, burial 20 (a male of 22-28 years) and burial 15 (a 14 year old of unidentifiable sex) were accompanied by nearly identical bear maxilla masks, suggesting a special ritual status. The youth of burial 15 raises the possibility that this status may have been inherited. However, the coefficient of morphological similarity for the two, 14/26, is somewhat below the means for the series, indicating that they were no more closely related than were most of the individuals in the cemetery.

EARLY WOODLAND

Early Woodland in southern Ontario is equated here with the Meadowood complex (ca. 900-400 B.C.), characterized by Vinette 1 ware and the distinctive Meadowood chipped stone assemblage (Spence and Fox, 1983; Granger, 1978). The subsistence and settlement systems are not yet well understood, although both spring occupation sites oriented toward fishing and fall deer and nut harvesting camps have been identified (Kenyon, 1979; Jackson, 1980; Fox, 1983). The better known burial components are Liahn II, Bruce Boyd, and Ault Park (Figure 1).

Poor preservation severely limits the osteological data from Liahn II (Williamson, 1978; Pfeiffer, 1978). Sixteen individuals were recovered from 13 graves. Only one cranial fragment, from a sub-adult with an adult burial in feature 8, shows burning. The other two multiple burials are feature 7, which contained a middle age adult and a child of 9-10 years, and feature 12, with an adult and a sub-adult. Both primary and disarticulated burials were present.

At the Bruce Boyd site 20 individuals were identified in 17 Early Woodland features (Spence, Williamson, and Dawkins, 1978). Five (3 adults and 2 sub-adults) were cremated while the other 15 (12 adults, 1 sub-adult, and 2 of uncertain age) were not. All burials were at least partially disarticulated, some only slightly so. Infants and children are clearly underrepresented. Multiple burials are:

1. burial F — an elderly male and an infant of 6-9 months.
2. burial H — an elderly male and a young adult female.
3. burial J — the cremated remains of a young adult and an individual of 8-15 years.

The range of faunal material with one burial and the variety of lithic forms in the two non-burial caches suggest participation by several individuals in at least some of the cemetery rituals.

Liahn II and Bruce Boyd produced an average of 1.20 individuals per grave. As with Glacial Kame, each feature probably holds most or all of the band dead from the preceding year. Assuming again the 3.4% death rate, band size would have been about 35 (c.f. Williamson, 1978:83). Cremation had become a minor form, perhaps more closely linked to sub-adults. To some degree, these changes may have been due to shifts in the settlement system that altered the conditions under which band members were exposed to the risk of death. Prolonged occupation of the spring-summer macroband site, for example, would lead to fewer deaths away from the cemetery. This in turn could be expected to produce fewer multiple burials, fewer cremations, and a higher proportion of sub-adults in the cemetery. Indeed, this does seem to have been the trend from Glacial Kame to Meadowood in southwestern Ontario. At Hind there were 11 single and 6 multiple burials, 13 cremated to 17 uncremated individuals, and 20 adults to 6 sub-adults. Liahn II and Bruce Boyd, in contrast, produced 24 single to 6 multiple burials (with fewer individuals on average in each multiple burial), 6 cremated to 30 uncremated individuals, and 24 adults to 8 sub-adults. Also, the poorer preservation at Liahn II and Bruce Boyd may have led to the total destruction there of some sub-adults. Still, a prolonged seasonal macroband occupation does not totally explain the difference in cremation profiles between the two periods. The presence of some extensively disarticulated yet uncremated skeletons at Bruce Boyd indicates that distance from the cemetery at the time of death was not the only factor conditioning cremation in the Early Woodland period.

Both local and regional variation can be identified in Early Woodland mortuary programmes. The heads of several individuals in the Bruce Boyd cemetery received special handling, something observed only rarely at other Meadowood sites (c.f.Williamson, 1978:107; Ritchie, 1955:30). On the regional level, cremation was apparently more common to the east, as was the case with Glacial Kame. It was a minor form at Liahn II, Bruce Boyd, and Wray (Ritchie, 1944, 1969), but was the dominant mode at Ault Park (Figure 1), Pointe du Buisson 5 (Clermont, 1978), Oberlander 2 (Ritchie, 1969), Muskalonge, and Red Lake (Ritchie, 1955). There may also have been a general decrease through time in the use of cremation, though a number of radiocarbon dates indicate that these differences are more spatial than temporal.

The osteological evidence, though weakened by poor preservation, suggests that the Early Woodland occupants of the Bruce Boyd site had no consistent post-marital residential practice. Measurements, possible on only two adult males, show surprising differences (Table 2). A few discrete traits (parietal foramen, open foramen spinosum) are somewhat more common than usual, but are distributed evenly between the sexes (Table 3). Tympanic dehiscence and auditory exostosis show the expected sex biases. Only the male predominance of mylohyoid arches is unusual, but the sample is too small to be reliable.

TABLE 2
Bruce Boyd Early Woodland cranial measurements

	burial E	burial F1
cranial length	178	192
cranial breadth	—	133
cranial index	*—	69.2
basion-bregma height	136	143
length-height index	76.4	74.4
breadth-height index	—	107.5
basion-nasion length	99	112
basion-prosthion length	96	102
upper facial height	76	73
nasal height	53	55
nasal breadth	26	31
nasal index	49.0	56.3
orbital height	35	33
orbital breadth	40	45
orbital index	87.5	73.3
palatal length	54	51
palatal breadth	38	36
palatal index	70.3	70.5
frontal chord	108	122
parietal chord	103	119
occipital chord	100	—

* parietal damaged, but estimate indicates brachycephaly (index of 80.0+).

MIDDLE WOODLAND

Our knowledge of Middle Woodland (ca. 400 B.C. - 500 A.D.) is spotty, resting on a few well excavated and reported sites. However, there does seem to have been a heavier occupation in at least some parts of southern Ontario, perhaps the end result of a "filling in" process that began millenia earlier (Noble, 1975). The Huron and Rice Lake shores have significant occupations by all major rivers, while the Early Woodland sites there are smaller and more widely scattered. Mortuary variability in the region increased, partially because of the varying impact of Hopewellian influences (Spence, Finlayson, and Pihl, 1979). However, although a number of Middle Woodland mortuary sites have been reported across the province (c.f. Kenyon and Cameron, 1961; Cybulski, 1982; Helmuth, 1972), only a few have produced enough evidence for a discussion of mortuary programmes.

Donaldson, on the Saugeen River (Figure 1), is a spring macroband camp that was used repeatedly over millenia (Wright and Anderson, 1963; Finlayson, 1977; Molto, 1979b). Though some refuse and non-burial features were located in the immediate vicinity of each of the two cemeteries, they probably represent prior or later use of the area; the cemeteries seem to have been functionally distinguished from the rest of the site at the time of their use (Wright and Anderson, 1963;9, 20; Finlayson, 1977;261, 279, 499). The Donaldson 2 cemetery is probably the earlier of the two, dating to the first century A.D., though some would place the Donaldson 1 cemetery well before the time of Christ.

The three burial features in Donaldson 2 held a total of 11 individuals (Finlayson, 1977:259-284; Molto, 1979b). Feature I held only one person, while feature G held 7 individuals representing at least 2, and perhaps as many

TABLE 3
Bruce Boyd Early Woodland discrete traits

Trait	Females sides	Females individuals	Males sides	Males individuals
frontal groove	2/2	1/1	0/4	0/2
supraorbital notch	1/3	1/2	3/4	2/2
supraorbital foramen	3/3	2/2	1/4	1/2
trochlear spur	0/1	0/1	1/5	1/3
accessory infraorbital foramen	2/2	1/1	0/4	0/2
accessory lesser palatine foramen	1/1	1/1	3/6	2/3
lambdoidal Wormian	0/2	0/1	2/2	1/1
asterionic bone	0/1	0/1	2/3	1/2
parietal foramen	3/4	2/2	4/4	2/2
tympanic dehiscence	3/4	2/2	0/6	0/3
auditory expostosis	0/4	0/2	4/6	2/3
divided hypoglossal canal	1/4	1/2	0/6	0/3
open foramen ovale	1/4	1/2	0/6	0/3
open foramen spinosum	2/4	2/2	3/6	2/3
foramen of Vesalius	0/4	0/2	3/6	2/3
pterygo-spinous foramen	2/4	1/2	0/6	0/3
mylohyoid arch	0/3	0/2	3/6	2/3

as 4, separate burial events. Feature H held 3 individuals, representing 2 or perhaps 3 events. In at least one case a later burial disturbed an earlier one while it was still intact enough to maintain some degree of articulation despite its displacement (Finlayson, 1977:280). Where the original condition of burials could be defined, they were either primary or had been dismembered. This suggests that each burial episode occurred not long after the deaths of the individuals interred. They may, then, represent seasonal additions to a feature use over a period of a year or more. With the uncertainty about the timing of the burials it is impossible to accurately estimate band size, though a group of 40-80 individuals could well have produced such a pattern.

Discrete trait lists by individual, supplied by J.E.Molto, show no traits with an unusual sex bias. The incidence of pterygo-basal spurs is somewhat higher than expected in the series (5/8), but they appear in 3 individuals of both sexes and in all 3 pits. Mylohyoid arches are restricted to feature G, where they appear in GD, an adult female, and in the two males GE and GF. The coefficients of morphological similarity (Table 1) are of little use in reconstructing post-marital residence, since the female coefficient is based on a single comparison between two individuals. However, the sex distribution of traits suggests no residential bias. The presence of copper panpipes with two males, GE and GF, buried either together or only a short time apart, may indicate a special ritual or political status (c.f. Young 1976). However, the coefficient for the two burials is only 7.15 (46.7%), compared to a general coefficient of 60.3%, so it is unlikely that assignment of that status was based on close descent relationships. In fact, there is no evidence for inherited status in the Donaldson 2 cemetery.

The grave goods and one radiocarbon date on bone (possibly contaminated by preservative) from the Donaldson 1 cemetery suggest a date of about 300-500 A.D., though this is by no means definite. Twelve individuals were recovered from six pits, two of which showed evidence of two separate burial episodes. Since the later additions consisted solely of primary burials, they may represent seasonal episodes. If so, about 1.5 individuals died each year, suggesting a band population of about 45. There is a high proportion of sub-adults, much higher than in Donaldson 2 (Molto, 1979b:34). It is unlikely that this represents a major shift in mortality patterns (but see Molto 1979b:38-39 for a conflicting view). Probably there was simply less concern with the retention of sub-adults for cemetery burial in Donaldson 2. The greater emphasis on sub-adults in Donaldson 1 is reflected also in the presence of grave goods with many of them; in Donaldson 2, offerings were associated exclusively with adults.

The coefficients of morphological similarity for Donaldson 1 are too poorly based to be reliable (Table 1). Still, the coefficient for the two males is high (14/17), suggesting some sort of relationship. This suggestion is reinforced by the presence in both of trochlear spurs and mylohyoid arches (Molto, 1979a, 1979b). However, since one of the males, individual BD, is only 15-16 years old, this apparent relationship cannot be taken as evidence of a patrilocal preference in post-marital residence.

At the Kant site in eastern Ontario (Figure 1), three burial pits with from one to three individuals each were excavated in what seems to have been a special cemetery area (Emerson, 1955:28-37). Emerson believed that there were four primary and two secondary burials, with two of the primary burials showing evidence of torture and mutilation. It seems equally possible, though, that the fractures noted by Emerson were post-interment and that the missing hand and foot elements were due to burial after some degree of decomposition, not torture. Sub-adults are conspicuously absent, and no grave goods were associated with the burials. It would be desirable to have a more complete osteological analysis of the series; published data deal exclusively with a single adult male (Popham, 1955; Wright and Anderson, 1963:104-105; Anderson, 1968:58, Table 29).

In the Rice Lake area of southcentral Ontario a more complex system developed (Figure 1; Spence, Finlayson, and Pihl, 1979; Spence, Pihl, and Molto, 1984). Burial mounds are distributed in clusters along the lake and the Trent River, the different mounds of each cluster representing temporally distinct burial episodes. At Cameron's Point at least 37 individuals had been included in Mound C. The reconstructed burial programme involved two stages: individual burial at or near the time of death, followed some time later by exhumation and mass reburial in a mound. The triggering event for mound construction was probably the death of the band headman, as was the case in some contemporaneous Ohio and Illinois sites (Greber, 1979:45-46; Griffin, Flanders, and Titterington, 1970:187). Band size can be estimated at between 100 and 200 (Spence, Pihl, and Molto, 1984).

The discrete trait data for these sites suggest a patrilocal tendency in post-martial residence, though the evidence has not yet been published in enough detail for the calculation of coefficients of morphological similarity. Molto (1979a) notes a full or partial expression of *Os Inca* in five Serpent Mound E individuals, four of them male. Discrete traits, broken down by sex, have been published for the Serpent Mounds (Molto, 1983:298-301), but three separate and non-contemporaneous mounds have been combined in the figures. Six traits show a male bias: tympanic dehiscence, ossified apical ligament, intermediate condylar canal, clino-clinoid bridge, parietal process of temporal, and mendosal suture (*Os Inca*). Only three (frontal grooves, supraorbital foramina, and parietal notch ossicles) show a female bias. Although some of these variations merely reflect known general sex biases, others appear to be significant. The incidence of tympanic dehiscence, 18.2% among males and only 8.7% among females, contrasts with the usual pattern of female dominance for that trait (Anderson, 1962). Ossified apical ligament, though generally more common among males, is disproportionately so in the Serpent Mounds group (43.5% among males but absent among females). Furthermore, these two traits played the major role in distinguishing the Serpent Mounds series from LeVesconte in biological distance measurements (Molto, 1983: Appendix E). They may thus represent just the sort of trait concentrations that are particularly meaningful in determing the internal organization of a group. It is uncertain how much of this variation pertains to Mound E itself, but a roster of Mound E discrete traits with sexes combined, published elsewhere, suggests that much of it may be sited there (Spence, Pihl, and Molto, 1984:Table 2). Discrete trait data have also been presented by sex for LeVesconte Mound, but the samples are much smaller and no clearly unbalanced distributions emerge (Molto, 1983:294-297).

Cameron's Point Mound C represents a single burial event. Of the 37 individuals interred there, 11 were in prepared sub-floor graves, were often fully or partially articulated, and had grave goods in several cases. The rest of the burials in contrast, were deposited in the mound fill with no grave goods and were invariably incomplete and disarticulated (Spence and Harper, 1968). The same pattern is visible, though less clear, in Serpent Mounds E (Johnston, 1968). The correlation of distinct location and treatment suggests that rank was to some degree ascribed (King, 1978); certainly the two categories apparent in the mounds represent fairly sharp distinctions. The distribution of *Os Inca* in Mound E supports this. Of the three cases which can be assigned a provenience, all are from elite sub-floor graves (Molto, 1979a). No such rare traits clarify relationships at Cameron's Point Mound C. However, trait incidences vary in several cases between sub-floor and fill burials (Table 4): parietal foramen, asterionic bone (representing 2 individuals in the fill and 3 in the sub-floor group), divided hypoglossal canal, mylohyoid arch, and enamel extension. This may be due to some genetic distinction between sub-floor and fill individuals, though with only three adults in the sub-floor category it is impossible to be sure.

Much of the above evidence could also be explained by a three-stage burial programme, one that does not lead to the assumption of inherited rank. The three stages would be:

1. the separate retention of each individual at the time of death, perhaps in a charnel house, on a scaffold, or in the residence.
2. after decomposition or perhaps in the first warm season, but in any case within a year or two, the individual is transferred to a grave in or near the site.
3. at the death of the band headman, all the previously deceased individuals are exhumed for final reburial in the mound. Those who had only reached the first stage were placed in sub-floor pits like the headman, while all others received a more casual burial in the fill.

This would explain the high proportion of partially or fully articulated individuals in the sub-floor burials (8 of 11 at Cameron's Point Mound C, 11 of 13 at Serpent Mounds E) and the presence of only incomplete, disarticulated bodies in the Mound C fill, features difficult to account for with the rank based model. If grave goods were not transferred from the second stage burial place, or were redistributed among the living during the second stage ritual, their restriction to sub-floor burials in Mound C would also be understandable. However, the distribution of *Os Inca* in Mound E and the apparent differences in trait frequencies between the fill and sub-floor burials in Mound C suggest a significant ascribed component to rank. Hopefully more detailed analyses now in progress will settle the question.

TABLE 4
Cameron's Point Mound C discrete traits

traits *	fill	sub-floor
supraorbital foramen	10/19	2/6
supraorbital notch	16/20	4/6
multiple supraorbital openings	3/16	0/6
frontal grooves	3/8	0/6
trochlear spur	1/8	0/4
accessory optic canal	1/3	0/3
zygomatico-ficial foramen	15/19	4/4
accessory infraorbital foramen	1/2	2/4
accessory lesser palatine foramen	2/4	5/5
parietal process of temporal	0/2	1/5
parietal foramen	8/9	1/6
parietal notch bone	0/4	2/5
tympanic dehiscence	4/15	0/6
marginal foramen	6/16	2/4
mastoid foramen multiple	3/12	1/5
mastoid foramen lateral	8/19	2/5
lambdoidal Wormian	2/6	0/6
asterionic bone	2/12	3/5
venous sinus to left	4/9	0/3
divided hypoglossal canal or spur	5/11	1/6
pterygo-basal foramen or spur	2/13	0/6
pterygo-spinous foramen or spur	1/10	0/6
spino-basal foramen or spur	1/7	0/4
foramen of Vesalius	11/15	0/5
open foramen spinosum	1/7	1/4
carotico-clinoid bridge	0/2	2/4
mylohyoid arch	8/14	1/6
accessory mental foramen	0/11	1/5
Carabelli trait	6/30	3/18
protostylid	1/38	0/13
extension, upper molars	7/38	0/16
extension, lower molars	11/41	2/13
extra root, upper molars	2/38	2/14
extra root, lower molars	2/45	0/13

* Incidences are based on adults or, in case of dental traits, on permanent dentition.

CONCLUSIONS

The little evidence we have suggests that burial in the Late Archaic period was generally done at or near the time of death, with perhaps only a limited number of participants in the ritual. Though large numbers of skeletons have been found at a few sites, these probably represent accumulations over a lengthy period. However, we cannot rule out the possibility that cemeteries extend well back into the Archaic. They may merely have gone unnoticed because of poor preservation and a lack of spectacular grave goods (Fox, pers. com.).

In the Terminal Archaic and Early Woodland periods special cemetery areas definitely occur (often removed some distance from the occupation sites), exotic goods are found frequently in the graves, and ritual caches in some cemeteries reveal a new aspect of mortuary ceremonialism. There is variation in the richnes of offerings even among individuals of the same age and sex, but this probably reflects differences in personal qualities and achievement rather than a formal rank system. For example, Early Woodland burial E of the Bruce Boyd site, a middle age male who had been effectively immobilized for some years before death by a severe hip infection received no grave goods. Archaeological and osteological evidence suggests bands of some 35-50 people with no consistent post-marital residential practice, leaving individuals free to respond flexibly to environmental and demographic pressures in their choice of band affiliation. Regional variation in mortuary practices can be identified, and apparently persisted for some time. Both regional and temporal differences probably reflect, at least to some degree, varying ecological adjustments.

Most archaeologists have associated the emergence of cemeteries, or what Chapman (1981) refers to a "formal disposal areas", with societies in which claims to a territory or critical resources are phrased in terms of ancestrally derived rights, and in which resources are in restricted supply, and so possibly subject to competition from outside the group (Saxe, 1971:50-51; Bradley and Hodder, 1979; Goldstein, 1981:59-61; Chapman, 1981). Tuck (1978), for example suggests that the Maritime Archaic cemeteries were a response to shifting resources and the intrusion of new groups. Cemeteries, especially those involving prominent landmarks like mounds, are thus both symbols and integrative mechanisms that maintain a claim against external competitors.

However, in the Terminal Archaic and Early Woodland periods bands in southern Ontario do not seem to have been unduly large or spaced uncomfortably close to one another, so there is no reason to suspect pressure on resources or inter-band competition. No evidence of conflict has been reported. Inter-band contact certainly occurred, but was probably in the form of marriage or individual trade partnerships (Spence, 1982). No formal expression of band identity and rights would have been required in such situations. Furthermore, if band affiliation were relatively open and internal structure informal, as the osteological evidence suggests, it seems unlikely that rights to land or resources would have been based on lineal ties to ancestors, or indeed that any sort of formal descent reckoning was practiced (Meillassoux, 1973:196).

In the absence of any compelling external justification for the development of cemeteries and intensified mortuary ritual, it may be suggested that their primary orientation was internal, with the band members themselves as the recipients of whatever message the rituals carried. One major function may have been macroband integration, the confirmation and reinforcement of the macroband as the principal social unit. The archaeological evidence is not yet clear on the first appearance of macrobands or their role in subsistence activities, but it may be that they developed or, more probably, took on new functions in the Terminal Archaic period (see Johnston 1984:81 for evidence of their presence in the Late Archaic). Since band membership was open and perhaps even somewhat fluid, cemeteries and ritual which involved the participation of all band members may have given the macroband the stability and continuity it needed to be effective. An individual's affiliation with the band, at least for a year or so, and his relative status within it would have been expressed and confirmed in a public forum that included a significant portion, if not all, of the band membership.

Although this pattern apparently persisted without significant change through the Middle Woodland period in much of southern Ontario, societies in the Rice Lake region took still another step. A burial programme that prominently featured social (perhaps rank) distinctions developed. Band size grew to over 100, and there was a tendency toward patrilocal residence. The social field in which status was fixed expanded in time, with burial ceremonies often involving the deceased of a full generation instead of just the preceding year.

This suggests that the conventional archaeological wisdom about cemeteries may now be closer to the mark. Increased band size and their fairly close spacing in the Rice Lake area, coupled with a prolonged macroband occupation extending well into the fall (Spence, Pihl, and Molto, 1984), may have taxed local resources on occasion, creating a situation in which it was desirable to have a more carefully defined and public claim to them. The mounds would have offered a visible symbol of this claim, while a consistent post-marital residential practice and an inherited component to status must have encouraged an emphasis on principles of descent and on ancestral ties.

Clearly band size and structure inevitably affect evolution and external interaction, and must be taken into consideration when interpreting biological distance measurements. Exogamy would have been virtually universal among the small bands of the Terminal Archaic, Early Woodland and (for most of Ontario) Middle Woodland periods. There would thus have been a high rate of gene flow over a wide area. On the other hand, rapid shifts in the genetic structure of some groups because of genetic drift could lead to some erratic distance measurements on the local level. This would have been compounded by the founder effect in earlier periods, as groups expanded and hived off to gradually fill in the region. The historical development of particular groups may thus be difficult to trace, particularly when the obscuring effects of wide gene flow are added to the picture (Molto, 1983:247, 256-258).

One might expect, then, that biological distance measurements for these periods would show wide similarity throughout the region, but with some unpredictable distances between sites thought to have been closely associated. In fact, most investigators have concluded that gene flow was extensive, freely crossing the cultural boundaries identified by archaeologists, while variability was still high within populations (Pfeiffer, 1977, 1979; Molto, 1979b; Schneider and Sciulli, 1983). The distorting effect of genetic drift on inter-group distances remains an obstacle to interpretation, but Molto (1979b) has evaded it for his Middle Woodland samples by combining sequential series (the two Donaldson cemeteries on the one hand and the three mounds of the Serpent Mounds site on the other). The two larger samples level out the irregularities caused by genetic drift, while still each representing a single evolving group over the same 400 or 500 year span.

Though the middle Woodland Rice Lake bands were larger, exogamy would still have been prevalent, particularly if an increased emphasis on descent led to the extension of marriage prohibitions. Gene flow should thus have remained high. On the other hand, the patrilocal bias of each band may have created localized trans-generational sequences characterized by a high degree of trait continuity. This would have resulted in persisting inter-band differences, while making the historical development of particular bands easier to trace. Still, preliminary distance analyses of the Rice Lake bands indicate that all were parts (albeit distinguishable parts) of a single gene pool, so gene flow apparently played the dominant role (Molto, 1983; Spence, Pihl and Molto, 1984).

Molto's analysis suggested an east-west division in southern Ontario during Middle Woodland, with Donaldson and the Serpent Mounds being parts of two distinct populations (1979b:47, 50). As Molto notes, however, only a very limited part of each area has been sampled and the samples are very distant from each other (Fig. 1). Considering the openness and high gene flow characteristics of most hunter-gatherer societies, it seems unlikely that there was a sharp boundary, genetic or cultural, between southcentral and southwestern Ontario, even along physiographic features like the Niagara Escarpment and the Nottawasaga and Grand rivers (Spence and Pihl, 1984: 40). As samples are obtained from intervening areas, a continuum will probably appear.

The ideas presented here are only hypotheses, plausible but unproven explanations for some features of the osteological and archaeological records. In some respects the archaeological record itself is not clear. Cemeteries and the associated features of social organization, for example, may actually have appeared as early as the Middle Archaic period (Fox, pers. com.). Clearly the proper testing of these hypotheses will require a good deal more work. Osteologists will have to pay more attention to internal variability, particularly along the dimensions of sex and status. This will require more than individual examination of discrete traits, though that has been emphasized here. In some Illinois Hopewell series, for example, status has been associated with variations in stature, patterns of arthritis, trace element composition, and enamel growth defects, indicating that differences in status had substantial repercussions in terms of activities, access to food in critical periods, and health (Buikstra, 1976:37-39; Tainter, 1973; Lambert, Spuznar, and Buikstra, 1979; Cook, 1981: c.f. also Hatch, Willey, and Hunt, 1983). Studies of some of these topics have been conducted on Middle Woodland populations in southern Ontario, though again the emphasis has been on the series as a unit and its relationship to other series, rather than on internal variability (c.f. Schwarcz, Katzenberg, Knyf and Melbye, 1983; Patterson, 1984). This is quite valid for some purposes, but remains inadequate for the analyses of structure that are necessary to fill out our understanding of the aboriginal inhabitants of Ontario.

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NOTES TO CONTRIBUTORS

MANUSCRIPTS

Please submit three copies. These must be typewritten and double-spaced throughout (text, quotations, tables, legends, notes and references) on one side only of 22 x 28 cm (8.5 x 11) paper with 2.5 cm (1 in) margins. Tables should be placed on separate pages at the end of the manuscript. All pages should be numbered consecutively beginning with the title page. The title page should include the title, author(s) and address(es).

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Metric units must be used (English units may be given in parentheses). Within the text all units must be written out (e.g., kilometres, grams, centimetres). When used in conjunction with numbers the appropriate, and unpunctuated, abbreviation should be given instead (e.g., km, g, cm). Temperatures are to be expressed in degrees Celsius (°C).

DATES

Radiocarbon dates should be given in ^{14}C yr BP. Both standard error and laboratory number must be included. If the Libby half-life is not used, please specify. Calibrated radiocarbon dates should be reported as calendar years (e.g., 4660 BC or 6610 BP) and the calibration scale used must be indicated. All historical dates should be given in years BC or AD (e.g., AD 1250 or 1250 BC).

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