ARCHAEOLOGICAL SYSTEMATICS AND THE ANALYSIS OF IROQUOIAN CERAMICS: A CASE STUDY FROM THE CRAWFORD LAKE AREA, ONTARIO

by

David Gray Smith

Department of Anthropology,
McGill University

Montreal, Quebec
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Abstract.

This study is an analytical examination of a stylistic anomaly observed among Middleport Iroquoian village sites (dating c. A.D. 1300-1450) located near Crawford Lake in southcentral Ontario, Canada. The anomaly is characterized by differing percentages of two forms of ceramic smoking pipes from closely spaced, contemporaneous village sites. This distinction occurs throughout southern Ontario, but is particularly pronounced in the Crawford Lake area. In order to develop and test a model to explain this anomaly, an approach employing a hierarchy of inference, including formal, spatial, temporal, economic, social, and cultural levels, is proposed. This is applied to an analysis of pottery and smoking pipes from eight Middleport sites. The key elements of the explanation are: (1) the two styles represent two distinct prehistoric communities; (2) these communities competed with each other for limited resources; and (3) they symbolized this competition through differences in pipe styles. This conclusion indicates that both the material culture and social relations among Middleport communities may be more complex than has previously been inferred.

Résumé

Cette étude est consacrée à l'examen analytique d'une anomalie de style observée sur le site des villages Iroquois Middleport (datant approximativement de 1300 à 1450 apr. J.C.) situés près du Crawford Lake dans le centre-sud de l'Ontario, au Canada. Ce qui caractérise l'anomalie est le pourcentage relatif différent de deux formes de pipe en céramique provenant de villages contemporains et situés près les uns des autres. Cette différence, qui se rencontre à travers tout le sud de l'Ontario, se présente de façon particulièrement marquée dans la région du Crawford Lake. Dans le but d'élaborer et de mettre à l'essai un modèle qui puisse expliquer cette anomalie, il est proposé d'aborder le problème en employant une hiérarchie de niveaux de déduction, c'est à dire, les niveaux formel, spatial, temporel, économique, social, et culturel. Cette méthode est appliquée à l'analyse de poteries et de pipes provenant de huit sites Middleport. Les éléments-clés de l'explication sont: (1) que les deux styles représentent deux communautés préhistoriques distinctes; (2) que ces communautés se faisent concurrence pour des ressources limitées; et (3) qu'elles faisaient symboliser cette concurrence par des différences stylistiques dans les pipes. Cette conclusion indique que la culture matérielle ainsi que les relations sociales parmi les communautés Middleport étaient peutêtre plus complexes que ce que l'on ait pensé jusqu'ici.

Preface

This dissertation is the result of my longstanding fascination with the substantive, methodological, and theoretical aspects of Iroquoian archaeology and prehistory. My interest in Iroquoian artifacts has been stimulated by my good fortune in being able to participate in many projects at prehistoric Iroquoian sites across southern Ontario. Among the first sites at which I worked were Crawford Lake, Rife, Unick, and Van Eden, four of the eight components considered in this thesis. Since then I have worked at Southwold, Nott, and Lawson (prehistoric Neutral sites in southwestern Ontario), Draper and Keffer (prehistoric Huron sites in southcentral Ontario) and Cleary and 27-VII (prehistoric St. Lawrence Iroquoian sites in southeastern Ontario) as well as Chypchar, Crawford Lake II, and other Middle Iroquoian Stage sites in the Crawford Lake area of southcentral Ontario. This research has exposed me to the extensive range and depth of variation in form and style of Iroquoian ceramics, and inspired me to attempt refinements in the analytical approaches employed in the study of such artifacts. This has led directly to the development of the ceramic motif taxonomy employed in this dissertation. This taxonomy has subsequently been used by my myself for analysis of ceramics from the Keffer site, and is presently being used by other researchers examining Iroquoian pottery and pipes in Ontario.

Although the responsibility for the research and inferences presented in the present study rests with me, this dissertation could not have been completed without the aid and support of several institutions and many individuals. I would like to acknowledge the

support of McGill University from whom I received a J.W. McConnell Memorial Fellowship for the first three years of my research, as well as a grant from the McGill Faculty of Graduate Studies and Research for two weeks fieldwork on the Chypchar site. The Museum of Indian Archaeology (London, Ontario), where all but one of the collections analyzed in this study are housed, supplied permission to study the artifacts, and supplied laboratory space and computer facilities. I also thank the late Dr. R.B. Johnson of the Department of Anthropology, Trent University, for permission to borrow the collection of ceramic artifacts from the Pipeline site.

Most of the artifacts examined were recovered through projects conducted prior to the initiation of the present research, but a limited amount of fieldwork was performed at the Van Eden and Chypchar sites to increase sample size and determine site size. I would like to thank Mel Brown, Marion Matson, Charles Turton, and a group of Mr. Turton's students from St. Robert's Catholic School, Gormley, for volunteer excavation and surface collection on the Van Eden site, and John MacDonald and Anne Brydon for excavation on the Chypchar site for limited remuneration. I would also like to thank Mr. and Mrs. Van Eden, and Mr. and Mrs. Chypchar for permission to excavate on their respective properties.

A number of friends and colleagues have contributed to the inferences generated though this study and the preparation of the dissertation. I would especially like to express my appreciation to Dr. W.D. Finlayson, Executive Director of the Museum of Indian Archaeology, who first suggested that I undertake this study of Iroquoian societies

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Finally, I would like to express my sincere gratitude and appreciation to my thesis committee in the Department of Anthropology, McGill University: Dr. Bruce Trigger, Dr. Michael Bisson, and Dr. Fumiko Ikawa-Smith. Dr Trigger served as my thesis supervisor, and guided me though all of the stages of my research and the production of

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This dissertation is dedicated to my parents and to Andrea, without whose understanding, encouragement and unfailing support, the completion of this work would have been much more difficult.

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CHAPTER 1.0

Introduction

The systematic study of the prehistory of northeastern North America through the archaeological record is approximately 100 years old. During these years the development of approaches to all aspects of archaeological investigation in this region has received significant impetus from trends in Iroquoian research. Techniques, methods, and theory have all undergone considerable change motivated by both internal stimulus and external influence. Prior to the 1960s Iroquoian archaeology had as one of its main goals the production of general spatial-temporal and functional syntheses, employing broad geographical and chronological scales based on data recovered from often limited excavations at a small number of sites (e.g. Wintemberg 1931; MacNeish 1952; Emerson 1954). After 1960, the emphasis began to change to more detailed studies in spatially limited areas, with the objective of generating more tightly controlled culture histories that would allow the study of more specific archaeological problems, such as political relationships (e.g. White 1961; Tuck 1971; Ramsden 1977).

Of the various approaches available to Iroquoian researchers, the analysis of artifacts, especially ceramics, has been relied upon the most heavily. It has been stated by Albert Spaulding (1960, 24) and David Clarke (1968, 20) that artifacts constitute the subject matter of the discipline of archaeology. Whether or not we agree that artifacts are the principal focus of archaeological research, there is no question that their study is fundamental to archaeology, and that an understanding of the assumptions, entities, and operations employed in such studies is crucial. In recent years archaeologists have increasingly

sought critically to re-examine and refine the methods used to study artifacts (e.g. Clarke 1968; Dunnell 1971; Rouse 1972). This trend is represented in Iroquoian research by attempts to upgrade existing methods by such scholars as Robert Whallon (1972) and William Engelbrecht (1974a). New methods and techniques have been introduced by researchers such as James Wright (1967), Peter Ramsden (1977), and myself (Smith 1983). This trend is discussed in more detail in Chapter 2.0.

Iroquoian archaeology is now about to proceed in new directions with new methods and objectives, with both internal and external influences playing their historic roles. This reflects trends in the discipline of archaeology in general. As it becomes increasingly sophisticated, greater numbers of more complex questions are being asked and more is expected of the archaeologist and the archaeological record. The challenge is to refine our techniques, methods, and theories to meet the demands that we place upon ourselves in relation to our data.

One spatially limited area within which investigations have recently been conducted is the Crawford Lake area of southwestern Ontario. It is postulated that the archaeological resources of this area are highly significant for several reasons: (1) the Iroquoian components in the Crawford Lake area appear to form a distinct cluster of sites that may represent more than one community; (2) the time span represented by these sites covers all three of the Iroquoian stages defined by Wright (1966): the Early Ontario Iroquois stage [A.D. 1000 to A.D. 1300], the Middle Ontario Iroquois stage [A.D. 1300 to A.D. 1400], and the Late Ontario Iroquois stage [A.D. 1400 to the historic period]; and (3) it has been demonstrated that the Crawford Lake area has a high potential for the reconstruction of palaeo-environmental

factors directly related to the Iroquoian occupation. As such, the Crawford Lake area offers an opportunity to pursue several important archaeological problems.

The present study was initiated as an examination of the ceramic artifacts, both pottery and smoking pipes, from eight of the prehistoric Iroquoian sites in the Crawford Lake area. The objective of the research was to pursue problems more complex than reconstruction of the spatial-temporal relationships among these components by relating patterns of variation exhibited by the ceramic artifacts to economic, social, and cultural aspects of the Iroquoian communities that occupied these sites.

Preliminary examination of the ceramic artifacts indicated what appeared to be a spatial anomaly among the assemblages recovered from the eight sites. This anomaly can be described as follows. Whereas the pottery styles from all eight sites appeared to be relatively similar and demonstrated gradual stylistic change from one site to another, the smoking pipe styles from four of the sites appeared to differ markedly from those of the other four components. In terms of the typology for Iroquoian ceramic pipes proposed by Emerson (1966), four of the sites yielded high proportions of the Plain Trumpet and Ring Trumpet types and low proportions of the Conical Plain, Conical Ring, and Conical Decorated types, while the pipes recovered from the other four sites showed exactly the reverse proportions. Because the sites are located relatively close to each other within a limited area (see Figure 4), it was expected that the variation in pipe styles would be much the same as the variation in pottery styles. The difference in the pattern of pipe styles compared to pottery styles was, therefore, interpreted as a

departure from the expected pattern of spatial distribution.

As an initial attempt to explain this anomaly, it was postulated that it might reflect differential social interaction with other Middleport groups by one or both of the communities in the Crawford Lake area. In order to prove some generalized comparative information, frequencies of both MacNeish's (1952) pottery types and Emerson's pipe types were collected from as many Middleport sites in Ontario as were readily available. As is discussed in more detail in Chapter 4.0, these data produce an interesting pattern. The difference in frequencies of trumpet and conical pipe, although not as pronounced as in the Crawford Lake area, was pervasive throughout southwestern and southcentral Ontario, whereas the pottery types demonstrated no such division. The anomaly, therefore, appears to be represented among contemporaneous sites that show no great spatial separation. This comparison demonstrated that the anomaly of pipe styles is not peculiar to the Crawford Lake area, but is, at least to some degree, a broader formal and spatial pattern. Since it has been argued that homogeneous 'horizon styles' developed among ceramics during the Middle Iroquoian Stage (Wright 1966), the anomaly in pipe styles seemed worthy of closer examination.

In light of the results of the preliminary examination of the ceramic artifacts outlined above, it was decided to focus the research of this dissertation on a detailed examination of this apparent spatial anomaly. Pursuit of this problem was formulated in terms of three research steps. The first was to document the existence and nature of the differences in stylistic variation in the assemblages of pottery and smoking pipes. In other words, it was necessary to determine if the spatial anomaly identified in an intuitive manner could be isolated and

described analytically. The second step was to generate an hypothetical model to account for the pattern of variation by relating it to the behaviour of the Iroquoian peoples who inhabited the sites in the Crawford Lake area. The third step was to test the model by proposing systematic arguments of evaluation and justification.

The following hypothesis to account for the proposed spatial anomaly in ceramic styles is presented and examined in this dissertation. It is proposed that the eight components from which the ceramic assemblages were recovered represent the archaeological remains of village sites occupied by two separate Iroquoian communities. These communities are distinguished from each other on the basis of the difference in smoking pipe styles, one community represented by the four sites that yielded 'trumpet' styles, and the other by the four sites that yielded 'conical' styles. Because the pottery styles demonstrate general similarity among all eight components it is postulated that the two communities were contemporaneous. In order to advance an explanation for the differences in pipe styles between the two communities it necessary to rely on the following assumptions based on ethnographic analogy with historically documented Iroquoian groups. Firstly, it is assumed that pottery was manufactured by women and that smoking pipes were made by men. Secondly it is assumed that both communities were economically and socially autonomous. The major proportion of the subsistence base came from the practice of a swidden (slash and burn) form of agriculture conducted by women, supplemented with faunal resources collected by men. They relocated their village sites once every 20 to 30 years when local resources were exhausted. Thirdly, it is assumed that there would have been some form of frequent

social interaction between contemporaneous communities located close to each other in space. With these assumptions in mind, it is proposed that each group of four sites being considered in this study represents stations occupied sequentially by one of the two communities. The distinction in pipe styles between the two communities constitutes a symbolic expression of economic and/or social tensions among the men. It is hypothesized that the area in the immediate vicinity of Crawford Lake was more amenable to winter deer yards than surrounding areas, and that one of the communities controlled access to these deer yards. Since both exploitation of faunal resources and pipe manufacture are assumed to be male activities, it is postulated that the differences in pipe styles were used as symbols of distinctiveness when men from each community interacted and pipe smoking was an important social activity.

Pursuit of the research problem as framed above involves an integration of archaeological theory, method, and technique within the context of the study of prehistoric Iroquoian ceramic artifacts. Because of this, I consider it useful to attempt an elucidation of what is meant by the terms 'technique', 'method', and 'theory' as they are used in archaeology. While these terms are useful descriptors of archaeological activities, the concepts underlying them have not often been examined explicitly in archaeological literature, even in works that deal directly with these topics (e.g. Willey and Phillips 1958). One exception is W. Taylor (1948, 6) who, in his critique of American archaeology, relied overtly on Kluckhohn's formulations as expressed in the following quotation:

> ... the category theory refers to the conceptual framework of a single discipline; the category method refers to the sheer analysis and ordering of data (as opposed to the formulation of abstract concepts in terms of which such ordering is carried on); ...

> Technique is distinguishable from method only in so far as method involves the interrelations and consistency of a number of techniques. For example, archaeology method encompasses a number of techniques such as surveying, photographing, field cataloguing and the like (Kluckhohn 1940, 43-44).

In this case, theory is viewed as a conceptual framework in contrast to method, which is seen simply as a set of techniques. The notion of a dichotomy between theory on the one hand, and method and technique on the other, has not been limited to Kluckhohn and Taylor, but is inherent in much of archaeological conceptualization. It emerged because of the equation of method with technique, and a failure to relate method to theory in any systematic fashion. The latter, in turn, has led to discrepancies between theoretical statement and methodological practice. As noted by Salmon:

> It is quite common to find ... archaeologists proposing statistical generalizations as hypotheses worthy of testing. They consider alternative hypotheses and weigh their prior probabilities, that is, any plausibility these hypotheses may have before they are subjected to testing, and they reject any hypotheses whose prior probabilities are so low as to disallow acceptance on the basis of tests that can be performed. ... All of this is sound scientific practice, but it does not fit well with the accounts of confirmation that are often presented in the theoretical parts of the archaeological literature (Salmon 1982, 5).

I see the major problem here as the lack of a systematic operational definition of method that relates it to technique and theory in archaeology. Although this problem will be discussed in detail in Chapter 3.0, I consider it worthwhile to provide an operational framework for these concepts at the outset for the purposes of the artifact analysis undertaken in this study.

Richard Rudner says the following about method:

> ... the methodology of a scientific discipline is not a matter of its transient techniques, but its logic

> of justification. The method of a science is, indeed, the rationale on which it bases its acceptance or rejection of hypotheses or theories (Rudner 1966, 5; emphasis in original).

In this quotation, it is evident that method is viewed as a link between technique and theory. If we accept that the objective of archaeological artifact analysis is to 'explain' patterns of variation (i.e. both similarities and differences) identified in artifact assemblages within the context of human behaviour, the linking nature of method can be rephrased in archaeological terms as follows:

Technique: the procedures used to recover artifact data and to elicit patterns of variation from them;

Method: the means of both (1) producing or generating, and (2) testing or evaluating theoretical models designed to elucidate patterns of variation in artifacts; and

Theory: the body of hypotheses or models used to elucidate patterns of variation.

The operation of proceeding hierarchically through this framework is considered in this study to constitute archaeological explanation using artifacts.

In more pragmatic terms, archaeologists generally pursue the following methodological procedure for analyzing artifacts. Once the artifacts are recovered they are examined for patterns of variation by means of classification. The pattern of variation identified in an assemblage of artifacts is then matched, or 'mapped', against patterns of variation that would be assumed to be produced by certain regimes of human behaviour. This procedure is the equivalent of comparing an empirical 'given' pattern with a hypothetical 'expected' pattern, thereby providing a link between material artifacts and the activity that

produced them. The sources for the assumptions underlying the generation of expected patterns are various, but most can be subsumed under what will be here called the analogical record. The analogical record includes information recovered from historical, experimental, and ethnographic research.

Archaeological classification of artifacts for purposes of examining patterns of variation and the use of the above listed sources for archaeological hypotheses are conducted routinely by artifact analysts. The articulation of observed and expected patterns has not, however, received much systematic examination. It is this articulation that can be said to constitute an archaeological method of justification in the context of artifact analysis.

It is my intention, in this dissertation, to re-examine methods of artifact analysis within an Iroquoian context with the objective of introducing refinements to these methods and applying them to some of the unique problems posed by the artifact assemblages from Iroquoian components in the Crawford Lake area. In other words, this dissertation is an experiment in method.

The archaeological resources of the Crawford Lake area offer the opportunity to investigate a number of important problems of Iroquoian artifact analysis. The problems cover spatial, temporal, economic, social, and cultural considerations, the details of which are unique to the Crawford Lake area, but in general form are applicable to all areas of Iroquoian research. The method that I will propose allows the integration of patterns of variation through a series of levels of inference that go beyond the restricted formulation of limited cultural-historical frameworks.

Research into method cannot be conducted in a vacuum. In fact, the

method proposed in this dissertation is a clarification and refinement of what archaeologists have been and are doing, not so much an argument for what they should be doing. In Chapter 2.0, the history of the archaeological study of prehistoric Iroquoian societies in northeastern North America is examined in order to elucidate the methods that have been employed and establish the specific context for the present research. A more general archaeological context for this research is investigated in Chapter 3.0, and the method that I intend to employ will be discussed. Chapter 4.0 supplies background information for the Crawford Lake area, summarizes the archaeological research that has been conducted in this area to date, and proposes a model to explain the spatial anomaly in smoking pipe styles that became apparent during the initial examination of the ceramic artifacts. In Chapter 5.0 the data collected for this dissertation is presented and the proposed method is applied. Chapter 6.0 summarizes the arguments and conclusions of this dissertation and discusses the ramifications of the research.

CHAPTER 2.0

An Historical Overview of Methods of Artifact Analysis in Iroquoian Archaeology

2.1 Introduction

In this chapter I will concentrate on the development of archaeological methods for analyzing Iroquoian artifacts. Since the focus of this dissertation is methodological, the discussion will deal primarily with the assumptions that underly methods. In addition, however, the influence of the technical and, especially, the theoretical aspects of Iroquoian research will be taken into account.

The historical development of archaeological analysis of Iroquoian artifacts may be viewed, for the most part, as a continuum based on the contributions of a number of researchers. Scholars attempting archaeological historiography have usually divided developmental continua into stages for analytical purposes (e.g. Willey and Sabloff 1980). Schuyler (1971) has argued that the use of such period schemes can be dangerous because the boundaries between the periods are often imposed arbitrarily and may mask important continuities and trends that crosscut stages. In the review presented here, I propose to take the middle road. In examining the historical development of methods for analyzing Iroquoian artifacts, I have identified some trends that I believe are important for the present study that are in evidence throughout this development. On the other hand, some other general, but nonetheless significant, changes in both methodological and theoretical approaches occurred at specific times in the development of Iroquoian archaeology. To encompass both of these trends, I will review the work of selected archaeologists that I consider to have contributed the most to the development of methods in the following section, and then discuss

the overall trends that emerge from this examination in the concluding section.

2.2 Archaeological Research on Prehistoric Iroquoian Societies in Northeastern North America

In A History of American Archaeology, Willey and Sabloff (1980, 12) call their earliest stage 'The Speculative Period (1492-1840)', and characterize it as a time during which a number of hypotheses were advanced that had little, if anything, to do with the archaeological record. This stage was manifested in northeastern North America by speculation on the origins of Iroquoian societies, and appears to have lasted longer, until about 1875, than is proposed by Willey and Sabloff for American archaeology in general. Much of the speculation was moulded by the attitudes held by Europeans toward native people encountered in North America. The archaeological tradition in North America was influenced by the focus of archaeologists on a prehistoric past separate from their own. Trigger has argued that:

> ... the single most important factor that has shaped the long-term development of American archaeology has been the traditional Euroamerican stereotype which portrayed America's native peoples as being inherently unprogressive. ... the influence of this stereotype has caused American archaeology to develop in a fundamentally different manner from European archaeology, which from its beginning was preoccupied with affirming that continuous cultural progress characterized that continent in prehistoric as well as historic times (Trigger 1980, 662).

In addition to characterizing them as unprogressive through time, this pejorative stereotype assumed that native cultures were internally homogeneous. Differences between archaeological assemblages were attributed to ethnic differences. Because of this, sequential differences that were recognized by early observers were attributed to migrations that brought about the replacement of Algonkian with

Iroquoian groups. Variation between the historic Iroquoian groups was attributed to dendritic fission within an earlier Iroquoian macro-group (Trigger 1978a, 277), and, as such, was minimized as mainly stylistic. This attitude led to an uncritical over-reliance on the Direct Historical Approach, and the application of ethnographic analogy from one Iroquoian group to another that has continued to the present (Trigger 1978a).

Migration hypotheses dominated the theories advanced to explain the origins of Iroquoian societies in northeastern North America until the 1940s. The first documented speculation that Iroquoian people did not originate in the lower Great Lakes area was proposed in 1641 by Jerome Lalement, a Jesuit priest residing among the Huron (Thwaites 1896-1901 vol. 21, 193-195). Later versions of the migrationary scheme varied in identification of the original Iroquoian homeland (e.g. Hale 1882; Lighthall 1899; Parker 1916). The migrationary hypotheses were proposed by ethnographers and historians who were not interested in archaeological data. Their interpretations were based on meagre historical records, native oral traditions, and ethnological data, with scant attention paid to the archaeological record (Trigger 1978a).

It was only after archaeologists began to recognize the amount of data that could be recovered from the archaeological record that examination of artifacts began to complement other sources of information on Iroquoian societies. This developing interest was a reflection of general trends occurring in North America during what Willey and Sabloff (1980, 34) call 'The Classificatory-Descriptive Period (1840-1914)'. It is at this time that we start to see some concern with methodological considerations relating to the investigation of artifacts. Approaches were, of course, heavily influenced by the

assumptions arising from the migration models that prevailed at the time. For example, since it was believed that Iroquoian culture was a relatively recent phenomenon in northeastern North America, it was not expected that any great amount of variation in Iroquoian artifacts would be found that might reflect temporal change. It was thought to be more productive to search for differences in artifact assemblages that reflected the distinction between earlier Algonkian cultures and the intrusive Iroquoian culture (Parker 1907; Wintemberg 1931), and to concentrate on ascriptions of artifact function that would aid in portrayal of native life-styles.

In northeastern North America, more detailed studies of artifacts began to appear in the second half of the nineteenth century. Some of the earliest descriptive accounts dealing with Iroquoian materials were produced by J.W. Dawson (e.g. 1860), although he did not recognize them as Iroquoian artifacts per se. Dawson's work was concentrated primarily on an examination of the form and function of artifacts.

With the work of W.M. Beauchamp and A.C. Parker in New York State the interest in artifacts as evidence of Iroquoian prehistory became well established, although both these researchers were more concerned with functional interpretations than with spatial and temporal considerations. In a series of monographs Beauchamp examined several different categories of artifacts such as lithics (1897), ceramics (1898), and bone (1902), concentrating on functional interpretations of these artifact classes. On the basis of his studies, he proposed that an identification of Algonkian and Iroquoian sites could be based on artifacts recovered from them, although he considered both Iroquoian and Algonkian peoples to be recent migrants into northeastern North America (Beauchamp 1900, 26). Study of Iroquoian materials was continued by

Parker, who excavated at a number of Iroquoian sites (e.g. Parker 1907) and produced a synthesis of the prehistory of New York State in 1922. He was among the earliest researchers in northeastern North America to advocate some quantification in artifact analysis (Parker 1922, 42), although his statistics were limited to relative frequencies of classes of artifacts found. Like Beauchamp, Parker devoted most of his energies to functional studies of Iroquoian and Algonkian artifacts, and his methods were moulded by this concentration. Function, in this context, meant the reconstruction of technical and economic (i.e. subsistence) lifeways at individual sites, with space and time assumed to be under control. His units of analysis were artifacts treated as physical objects that could be sorted into categories reflecting their functional utility. His basis for inferring the functional meaning of these classes was primarily ethnographic analogy, inspection of unfinished specimens, and study of evidence of manufacture. For example, in his examination of pottery from the Ripley site (Parker 1907, 538-540), he concentrated on evidence for manufacture, firing, and use of the vessels. Only in the following statement does he consider spatial and temporal factors:

> The general type of the vessels is Iroquoian but ... they differ in many respects from the central New York specimens of the middle 17th century as well as from Erie vessels of that period (Parker 1907, 539).

Since Parker inferred that Ripley was occupied by Eries in the late sixteenth and early seventeenth centuries A.D. (1907, 531), he recognized temporal differences between the pottery from this site and later (mid-seventeenth century A.D.) examples, as well as spatial differences that he assumed to be ethnic (Erie versus the Iroquois of central New York). The connection with the middle of the seventeenth

century was important because Parker inferred the cultural affiliation of the people of Ripley by historic identification of the inhabitants of the area where the Ripley is located:

> In the Jesuit Relations are found many references to a people who inhabited the region of which the Ripley site forms a part. These people are variously called the Eries ... Besides the accounts by the Jesuits there are several maps which place the Erie Indians in this territory (Parker 1907, 526).

In this we see recourse being made to the Direct Historical Approach, an important interpretive method in archaeology. As Willey and Sabloff describe it:

> Very simply stated, the Direct Historical Approach means working back into prehistoric time from the documented historic horizon. In archaeology it involves sites where Native American Indian groups are known to have lived in early historic times so that the excavation of these sites reveals artifact complexes that can be associated with identifiable tribes or ethnic groups. The archaeologist may then find other sites in the region whose artifact complexes show stylistic overlap with the historically identified complexes but whose origins or beginnings go back to prehistoric times (Willey and Sabloff 1980, 114).

The Direct Historical Approach relies on a number of assumptions, the most fundamental of which is that inferences can be made about a prehistoric group on the basis of information concerning that group's historical descendents. It is, in other words, a form of detailed ethnographic analogy between prehistoric and historic cultures that relies for its justification on the historical and ethnic continuity of the societies involved. The Direct Historical Approach is a powerful method of analogy if well controlled, but, unfortunately in spite of or perhaps because of its power, it is also liable to misuse and abuse, as will be discussed below.

The work of Beauchamp and Parker influenced the research of David

Boyle, who established the first relatively representative data base in Ontario (Killan 1983). Like theirs, Boyle's classification of artifacts was based on functional ascription. Boyle shared the stereotype of North American native peoples as inherently unprogressive (Killan 1983, 182), causing him to regard study of spatial and temporal variation as, for the most part, unproductive. His study of artifacts was limited by the lack of a systematic, quantitative methodology. The source for his functional interpretations was his artisan's intuitive appreciation of artifacts and analogy based on his reading of American ethnological literature. His ideas on social and cultural aspects of Iroquoian society were assumptions based on attitudes and speculations, such as migration hypotheses, current at the time, and he did not go beyond them. Boyle's importance rides on his transfer of emphasis from speculation to the archaeological record, and his influence on other researchers such as Andrew Hunter, George Laidlaw, and William J. Wintemberg.

An emphasis on artifacts was continued in Ontario by Wintemberg, whose most intensive and systematic work was done on Iroquoian sites in southern Ontario (e.g. Wintemberg 1928; 1936; 1939; 1946; 1948). Like Boyle, Wintemberg was heavily influenced by the theories and attitudes current in Iroquoian research in the early twentieth century. He subscribed to the migrationary model throughout his career, although data he collected was later used as the basis for an alternative explanation of Iroquoian origins. Because of this, Wintemberg assumed the same shallow temporal depth and limited spatial variation in Iroquoian culture as Boyle. Thus, there was no stimulus for him to become more interested in spatial or chronological research.

Although Wintemberg concentrated on functional research, he was

also aware of variation in assemblages of Iroquoian artifacts that was not functional and that he inferred to be spatial and temporal. As early as 1900 he drew distinctions between what he thought were early Algonkian and later Iroquoian artifacts (Wintemberg 1900). He also recognized variation in artifacts from different prehistoric Iroquoian sites in southwestern Ontario. He interpreted this variation to indicate "... successive stages or periods of development, viz.: archaic, transitional, and late pre-European" (Wintemberg 1931, 66). The basis for his distinctions was comparison of assemblages of artifacts from individual sites, mainly ceramics, which he believed were the most culturally sensitive of artifacts (Wintemberg 1931, 67). It is of significance that, although Wintemberg relied on groups of artifacts as physical objects for his functional studies, he began to examine attributes of artifacts in his limited spatial and temporal studies. Because he considered functional inference more important, his study of attributes was, however, mostly intuitive and never very systematic. For example, in his investigation of temporal variation in Neutral pottery and pipes the closest he came to quantification was to note the relative presence or absence of certain attribute states or specific characteristics such as interior punctates or globular vessel shape (see Wintemberg 1931, 81-86).

Wintemberg recognized common elements between what he called Algonkian pottery and pottery of his archaic Neutral period that had disappeared by the time of his transitional period. He ascribed these similarities to diffusion from the indigenous Algonkians to the intrusive Iroquoians. The following quotation contains examples of many of the attributes Wintemberg was using, the method of comparison he employed, and the conclusions he reached, all of which are important to

our discussion:

> The most common type of pot from Neutral sites of the archaic period has a round-bottomed globular body, slightly constricted neck and flaring mouth ... The exterior decoration is confined to the rim and neck, and the inside is more extensively decorated than Iroquoian ware generally, in which respect it is like some Algonkian ware. The decoration is mostly geometrical and is both rectilinear and curvilinear, most of it consisting of simple elements, which were stamped, punched, or made with the fingernails. Some of the impressions appear to have been made with cord-wound twigs, but the ware bearing this kind of decoration was probably either obtained from Algonkians or was made by Algonkian captives ... Pottery from Neutral sites of the transitional period retains certain features of that of the early period ... No ware of this period shows evidence of Algonkian decorative technique like that seen on ware of the archaic period. ... There is not much change in the pottery from neutral sites of the late pre-European period ... (Wintemberg 1931, 83-84).

Here we see the analytical entities (variables of vessel shape and decoration) and a rudimentary form of the analytical technique (similary seriation) that were to become the basis of spatial and chronological studies within a decade of Wintemberg's death. The three periods into which he divided Iroquoian development are essentially the same, including their chronological order and distinctive material characteristics, as those proposed thirty-five years later by James Wright (1966). In addition, Wintemberg appears to be the first researcher of Iroquoian prehistory to introduce the concept of evolutionary change that could be investigated using the archaeological record. Wintemberg had the basis for the in situ hypothesis of Iroquoian development at his fingertips, but his reluctance to challenge the prevailing migration hypothesis prevented him from grasping the implications of his work. Thus he interpreted gradual stylistic change as evidence of culture contact and assimilation.

During the period from 1875 to 1945, archaeology became a

systematic discipline in northeastern North America. Iroquoian studies were in the forefront, in part because Iroquoian society and Iroquoian sites were the most recent prehistoric ones, and because they yielded the most artifacts. A data base of Iroquoian artifacts was established and rudimentary archaeological methods were developed. Methodologically, the prime analytical entity was the artifact as a physical object, with attributes used only informally and in a limited manner in Wintemberg's spatial and chronological inferences. There was little concern with detailed documentation of artifact provenience within sites. Functional ascription was the primary goal of artifact study. The dominant source of inference and means of hypothesis testing was recourse to ethnography, experiment, and observation. The preferred models of explanation for diversity evident in the archaeological record were based on migration and diffusion.

During the decade between 1940 and 1950, extensive changes in both method and theory came about in a rather abrupt manner. These changes were heavily influenced by developments in American archaeology that occurred in the first half of the twentieth century. Willey and Sabloff call the period in American archaeology from 1914 to 1960 "The Classificatory-Historical Period", and subdivide it into two stages: 'The Concern with Chronology (1914-1940)', and 'The Concern with Context and Function (1940-1960)' (Willey and Sabloff 1980, 83-180). The objective of the first stage, as the name implies was to provide controlled temporal frameworks for archaeological materials. The objective of the second stage was ostensibly to consider function and cultural context in addition to chronology.

Two important chronological methods for studying artifacts, stratigraphy and seriation, were introduced into American archaeology

after 1900. Stratigraphy is a relative dating technique based on the principle of superposition of archaeological deposits. Seriation, employed most often as a relative dating technique, relies on recognition of patterned variation in the archaeological record that is in turn based on principles of classification: According to Dunnell (1986, 26) and Haag (1986, 69) the notion of patterned variation underlying seriation arose from detailed observations of regularities in stratigraphic settings:

> Stratigraphy, however, did provide a starting point for a general solution. Uhle, working in Peru (1903) and California (1907), and Gamio (1913) working in Mexico, followed shortly by Kroeber (1916), Nelson (1916), and Spier (1917) in the American Southwest, began to notice that whenever the relative order of archaeological deposits was known, the artifacts contained in them, if described in a certain way, later termed styles (Collins 1927; Kroeber 1919), displayed a regular and distinctive distribution. The potential of these observations for developing a general method was almost immediately recognized (Nelson 1916). ... The generalizations about the temporal distribution of style ..., led to the establishment of a standard procedure for the definition of type (Krieger 1944). ... In areas where ... additional chronological information was lacking, as in the Southeast, types tended to be defined so that they had lengthy temporal distributions and seriation was used to construct chronologies (Dunnell 1986, 26-27).

Since few sites known in North America, except shell mounds, were occupied for periods of time long enough to make them seem amenable to stratigraphic investigation, seriation became very important as a chronological method. As a result, many archaeologists during the first decades of the twentieth century directed their efforts toward typological studies for purposes of producing archaeological entities useful for seriation. The objective was to isolate types that showed historical significance, meaning that the nature and frequency of types would vary in a patterned fashion through time. With the seriation

studies of James Ford (e.g. 1938), there began the long-lasting emphasis on types as units of analysis in eastern North America that characterized the Classificatory-Historical period.

The nature, validity, and utility of the type concept and the typological method have been points of contention for decades and are crucial to the problem of classification in archaeology. The main debates have centred on the definition of a type, whether types are discovered or imposed, and whether types are clusters of attributes or clusters of artifacts. These questions will be addressed later in this chapter and in the next chapter. Suffice it to say at present that the typological method is a means of classifying archaeological data into units or types on the basis of perceived indices of variation, usually attributes, for purposes of pursuing a particular archaeological problem. In other words, typology is meant to be a mediator between the archaeological record and the attempts of the archaeologist to interpret it. Ford's view was that types are groups of artifacts classified on the basis of similarity of traits within the groups and dissimilarity among the groups. He deemed the groups of artifacts to be useful if statistical variation in this relative similarity and dissimilarity could be demonstrated to be historically significant. Ford's focus, then, was on the groups of artifacts, or types, in and among themselves, not on the characteristics or attributes of the artifacts. He considered these types to be imposed on the material by the archaeologist; that is, typology is an etic procedure (Ford 1938; 1954).

Rouse, on the other hand, placed more emphasis in his typological work on attributes than did Ford (Willey and Sabloff 1980, 110). He distinguished between two levels of typological entities: modes and

types. Modes were considered to be recurring attributes that demonstrated functional and cultural, as well as chronological, significance while types were groups of recurring modes that, because of their composition, demonstrated a higher level of such significance (Rouse 1939). Rouse considered classification to be emic in nature, being directed toward discovering modes and types inherent in living societies:

> By the term mode is meant any standard, concept, or custom which governs the behavior of the artisans of a community, which they hand down from generation to generation (Rouse 1939). Such modes will be reflected in the artifacts as attributes which conform to a community's standards, which express its concepts, or which reveal its customary ways of manufacturing and using artifacts. Analytical classification focuses on these attributes and, through them, attempts to get at the standards, concepts, and customs themselves. In effect, it attempts to read such modes out of the artifacts (Rouse 1960, 314).

In other words, typological classification, according to Rouse, should be directed toward isolating entities that demonstrate functional and social-cultural, as well as chronological significance.

The type concept was further developed by Alex Krieger. Krieger was influenced by Ford's and especially Rouse's work. He defined a type as follows:

> ... each recognized type is defined by a specific and cohesive combination of features ..., and furthermore includes what is believed to be individual variation within the technical pattern; the type as a whole is also understood to occupy a definable historical position, that is, its distribution is delimited in space, time, and association with other cultural material (Krieger 1944, 277-278).

Like Rouse, Krieger considered the objective of classification to be the discernment of emic entities that would have more than just chronologically significance.

As well as the emergence of the on-going debate about typology, the

adoption of the Direct Historical Approach as an important interpretive method in American archaeology occurred during the Classificatory-Historical period. In addition to typological methods, methods for classifying archaeological cultures were also developed in American archaeology during the first stage of the Classificatory-Historical period. The most influential of these in northeastern North America was the Midwestern Taxonomic System (McKern 1939). This method was originally formulated by a committee of archaeologists, led by W.C. McKern, in 1932. One of the members of this committee, representing the northeast, was James Griffin, who was to be quite influential in Iroquoian studies. The objective of the system was to order archaeological cultures on the basis of formal characteristics alone, and not on inferences about spatial or temporal significance. Identification of historically known groups with the archaeological classes produced using this method was also eschewed as a matter of principle (McKern 1939, 302). The taxonomy of the method is a hierarchy consisting, in McKern's words, "... of five major divisions: focus, aspect, phase, pattern, and base, progressing from localized detailed to large general classes" (McKern 1939, 310). Archaeological cultures in northeastern North America were classified in terms of a number of foci, aspects, and phases which were, in turn, lumped into the Woodland and Mississippi Patterns.

The adherents of the Midwestern Taxonomic System did not argue that cultural-historical studies were precluded by this method. Instead they maintained that a means of classifying archaeological cultures based on archaeological evidence was a necessary first step:

> In brief, the archaeologist requires a classification based upon the cultural factor alone; temporal and distributional treatments will follow as accumu-

> lating data shall warrant. Moreover, the archaeological classification necessarily must be based upon criteria available to the archaeologist (McKern 1939, 303).

In this statement McKern identified distributional, temporal, and cultural factors as involved in archaeological interpretation. The cultural factor is related directly to 'criteria available to the archaeologist', that is, artifacts. The implication is that cultural meaning can be read directly from, or ascribed to, the archaeological record without concern for spatial or chronological context.

With the climate of concern over chronology then prevailing it is not surprising that the cultural classes produced through the Midwestern Taxonomic System were interpreted in temporal terms. Walter Taylor observed that acceptance of the Midwestern Taxonomic System influenced such prominent archaeologists in northeastern North America as William Ritchie and James Griffin to abandon their functional studies of artifacts in favour of chronological interests (Taylor 1948). Trigger argues that:

> The Midwestern Taxonomic Method, by encouraging the definition of cultural units, helped to foster an effective interest in cultural chronologies and in broader relationships between cultures and between cultures and their environments (Trigger 1978c, 17-18).

In reality, then, the Midwestern Taxonomic System, because it was simply a method of classifying cultures, was meant to be incorporated into whatever interpretive approach - cultural-historical, functional, or social-cultural - happened to be employed. As is the case with any method, however, the Midwestern Taxonomic System was subject to abuse. In spite of McKern's warnings, sweeping identifications of patterns were made with historically known native groups. Iroquoian groups were considered to be an Aspect of the Mississippi Pattern, while Algonkians

were identified with the Woodland Pattern. Wintemberg, for example, attempted to fit Iroquoian groups into a framework of foci of the Iroquoian Aspect of the Mississippi Pattern, and, because of the southern hypothesis, argued that the Iroquoian Aspect was intrusive into the Algonkian Woodland Pattern in northeastern North America (see also Trigger 1980, 668).

The first stage of Willey and Sabloff's Classificatory-Historical period in American archaeology from 1914 to 1940 coincided almost exactly with the professional career of Wintemberg. As can be readily seen, however, the methodological developments in archaeology described above had little direct impact on Wintemberg's work. Whereas Wintemberg demonstrated only a limited interest in temporal relationships, the emphasis on chronology in the United States caused functional studies such as Wintemberg's to become less popular in that country.

The approach employed to study Iroquoian prehistory changed radically in the 1940s with the formulation of an alternative hypothesis to explain the origins of Iroquoian culture. The southern hypothesis first came under criticism when the taxonomy of the Mississippi and Woodland Patterns as applied to Iroquoian components was questioned. James Griffin (1943) and Bertram Kraus (1944) suggested, in effect, that instead of being an Aspect of the Mississippi Pattern, Iroquoian culture should be classed as an Aspect of the Woodland Pattern. They did not question the Midwestern Taxonomic System itself, but simply proposed a revision of the cultural classification. More important was the change in the interpretation of the culture-history of Iroquoian prehistory that the revision demanded. In an unpublished report on his excavations at the Pound site in southwestern Ontario written in 1939, Phillleo Nash suggested that archaeological data from Pound raised "... the strong

possibility that the Iroquoian cultures developed right in the St. Lawrence and Lower Great Lakes region ... (Kapches 1977, 9).

Unfortunately Nash's report never received wide circulation. In a more influential paper Griffin (1943) cautiously questioned the migration hypothesis of Iroquoian origins by suggesting that researchers should consider the possibility that Iroquoian culture was indigenous to northeastern North America and not the result of migration. Although his strategy was to examine the problem with the five approaches of ethnology, linguistics, physical anthropology, history, and archaeology, his conclusions were, for the most part, based on archaeological evidence. Indeed, he chided American students of native culture for ignoring archaeological information:

> In spite of the fact that American anthropologists in general have been labeled as belonging to a "historical school," very little attempt has been made in the past to provide a historical (archaeological) explanation of the development of the contemporary Indian cultures (Griffin 1943, 371).

To support his hypothesis of indigenous Iroquoian origins, Griffin cited a number of traits or elements, particularly of pottery, that showed similarities between Iroquoian and supposed Algonkian artifacts. These elements are basically the same as the attributes Wintemberg recognized. In fact, Griffin used archaeological data published by Wintemberg from the Uren site (Wintemberg 1928) to suggest that sites that had been classed as Woodland were not necessarily Algonkian ethnically, and that Iroquoian culture had developed directly from the antecedent Woodland (Griffin 1943, 369).

The alternative explanation of Iroquoian origins, or <u>in situ</u> hypothesis as it came to be called, had a number of methodological ramifications. In contrast to the southern hypothesis, it suggested a

relatively long period of continuity in Iroquoian culture, and implied that Iroquoian culture-history was not well understood. This meant that Iroquoian prehistory was more amenable to the kinds of chronological studies being conducted in the eastern United States at the time than it was considered to be under the migration hypothesis. Since Iroquoian sites are rarely stratified, the best available means of conducting such chronological study was typological classification and seriation. The hypothesized cultural continuity of a long period of Iroquoian prehistory ending with the historically known Iroquoian societies also implied that the evolutionary perspective that Wintemberg had initiated and use of the Direct Historical Approach could be extended much further into the past than had been thought. In the same article in which he formulated the in situ hypothesis, Griffin suggested an archaeological approach that includes the typological method, seriation, and the Direct Historical Approach:

> After the culture content of our test group has been ascertained for the earliest historic period, the next step is to search for sites with material of similar type but belonging to the period immediately preceding white contact in the area. Once the artifacts from such sites are studied, it is possible to correlate the early historic with the late prehistoric and to identify the new types of artifacts which were being introduced and something of the direction of the cultural drift which was interrupted by European contact (Griffin 1943, 359).

It is this methodological approach that came to dominate the archaeological study of Iroquoian societies from 1945 until 1965, and, in some quarters, is still in use today.

Although Griffin did not employ the typological approach to test the in situ hypothesis of Iroquoian development, he encouraged Richard S. MacNeish to do so (MacNeish 1976). MacNeish undertook this typological study between 1946 and 1948. The objectives of his research

were to establish a spatial and chronological framework for prehistoric Iroquoian societies, and through this framework, to demonstrate the temporal continuity of material culture that would support the in situ hypothesis. The approach that he used shows the influence of Griffin and the general trends of American archaeology at the time:

> My analysis was based upon (1) the assumption that each Iroquoian tribe had distinguishable and distinctive ceramic complexes, which had had distinctive developments, and (2) the strategy of the direct historic approach; I would start with the ceramic complexes of known tribes and work back into the prehistoric (MacNeish 1978, 36).

In his typological study, MacNeish overtly subscribed to the concept of a type espoused by Rouse and Krieger as opposed to that of Ford, although elements of Ford's approach were also included. He was highly influenced in this respect by William Ritchie, with whom he had undertaken a study of the 'pre-Iroquoian' (Owasco) pottery of New York State (Ritchie and MacNeish 1949). Like Rouse and Krieger, both Ritchie and MacNeish claimed to believe that the proper role of typology was to produce types that showed more than simply spatial and temporal significance. In this they were mirroring the emerging concern for cultural context that Willey and Sabloff (1974, 131) argue became important in their second stage of the Classificatory-Historical period (The Concern with Context and Function (1940-1960)). They were also influenced by Walter Taylor's criticism of American archaeology as being limited to description of culture-history. Like Ford, Ritchie and MacNeish saw a type as a cluster of objects:

> We have defined a type as a group of objects exhibiting interrelated similar features which have temporal and spatial significance [Krieger 1944, 272; 277-8]. We conceive of the typing of archaeological materials as an attempt to recapture the stylistic concepts in the minds of the original makers and to group these concepts in such a way as to show their

> trends in time and space. We believe that, at least to a certain degree, our types reflect aesthetic and utilitarian standards of value which operated as cultural compulsives on the minds of the artisans and, therefore, they possess some genuine measure of intrinsic validity (Ritchie and MacNeish 1949, 98).

To the above they attached a footnote reading: "Both Rouse (1939, p. 15) and Taylor (1948, p. 130) appear to express an essentially similar point of view". As well as demonstrating spatial and temporal significance, they argued further that:

> ... the achievement of a pottery typology for New York would elucidate problems of prehistoric culture diffusion and development over the Northeastern area and might, indeed, contribute to broader interpretations of cultural dynamics and processes of acculturation involved in the complex interconnections of sequential archaeological components (Ritchie and MacNeish 1949, 97-98).

Yet, in this they were merely paying lip-service to Taylor's conjunctive approach, for their main concerns remained limited to the elucidation of spatial and temporal pattern.

MacNeish, in turn, applied the typological method to Iroquoian pottery from sites in Ontario and the United States, initiating a long period in Iroquoian archaeology during which the chronological study of ceramics was the primary focus of research. The technique he employed was basically the same as that he had used in conjunction with Ritchie. He selected certain attributes from the rims of pottery vessels that he considered to have spatial and chronological significance (modes by Rouse's definition) and combined these attributes to group rim sherds together in types as clusters of objects. The attributes that he selected were the same as those that Wintemberg had used in his chronological study: (1) the shape or form of the rim of the vessel, (2) the motif of decoration associated with the rim of the vessel, and (3) the technique of application of the decoration. MacNeish did not

attempt to demonstrate quantitatively the independent spatial or chronological significance of the attributes he selected, nor did he concern himself with the mathematical association of these attributes in terms of his types. The selection and combination of the attributes was, in other words, intuitive. MacNeish later admitted himself that he had not attempted to define his types in an analytical fashion:

> Obviously, I was not using all the possible ceramic attributes nor were statistical formulae used to determine if the ones I used were, in fact, the most significant or sensitive to temporal change, that is, the best modes (MacNeish 1976, 83).

In addition, whereas MacNeish stated that the attributes he employed were all treated equally when he formulated his typological series, in fact one attribute was often stressed in contrast to others to form a hierarchy of attributes. Although there is nothing intrinsically wrong with constructing types by treating attributes on a taxonomic (or hierarchical) as opposed to a non-taxonomic (or paradigmatic) basis, according to Dunnell (1971), this procedure of favouring one attribute instead of others was not applied systematically or consistently.

In order to test the spatial and temporal significance of the typological series that he formulated, MacNeish used his types to conduct a frequency seriation of the Iroquoian sites from which he had obtained rim sherd samples. I have previously described the procedure he used as follows:

> First, he separated the components, rather arbitrarily in some cases, into sets which he thought were analogous to major tribal divisions. This identification was based primarily on the geographical location of the components. Each of these major units was defined by a distinctive set of pottery types, whose frequency of appearance varied consistently through time. Secondly, by seriating the frequencies of pottery types for each of the sets of components with which he was dealing, he constructed a temporal sequence for each of these

> hypothesized tribal units. The technique he used was simple similary seriation. This involved judging the similarity between sites on the basis of the degree of overlap of types, and placing the most similar sites next to each other in series. In order to verify this chronology, he employed the direct historical approach ..., attempting to have each of his sequences terminate with an historical component of known ethnic identity (Smith 1983, 7).

The results of MacNeish's study (1952) established a revised culture-history for Iroquoian societies in northeastern North America. This revision, based as it was on a more analytic approach to the archaeological record than any previous approach, was very convincing, and was accepted by most students of Iroquoian prehistory.

In New York State, the in situ hypothesis was accepted by Ritchie and his associates (Ritchie 1951; 1961b). By comparing MacNeish's pottery types with the series of pre-Iroquoian Owasco pottery types he had developed in conjunction with MacNeish (Ritchie and MacNeish 1949), Ritchie was able to argue that the Owasco manifestation in New York State was in fact a transitional or proto-Iroquoian society. This supported the contention that the Iroquoian Aspect was part of the Woodland Pattern as opposed to the Mississippian Pattern according to the Midwestern Taxonomic System. Ritchie encouraged others to test the in situ hypothesis, leading to important work such as Lenig's on the League Iroquois (1965), and Tuck's on the Onondaga (1971).

Ritchie had firmly embraced the typological method prior to MacNeish's study of Iroquoian pottery, and was instrumental in the development of the series of Iroquoian pottery types through his contributions with MacNeish. He did not limit his work to the study of Iroquoian societies, however, but concentrated on the entire prehistoric occupation of New York State from Palaeoindian times onward. On the one hand, this gave him a broader perspective than that of MacNeish, and he

extended his interests to other artifact categories besides pottery. For example, he was one of the first and only researchers of his time to attempt to apply the typological method to Iroquoian projectile points (Ritchie 1961a), and he conducted pioneering studies of Iroquoian settlement patterns (e.g. Ritchie 1956; Ritchie and Funk 1973). On the other hand, Ritchie's interests limited him to broad scale syntheses of culture-history with little concern for the ramifications of the methods he used. He tended to accept the methodological approaches of other researchers without examining them critically. Although he made many important substantive contributions to Iroquoian studies during his long and productive career (e.g. Ritchie 1938; 1944; 1951; 1956; 1961b; 1965), his methodological innovations were minimal.

In Ontario, a number of debates arose concerning the nature of MacNeish's spatial and temporal framework (see Emerson 1959; 1961; Ridley 1958; 1963; Ramsden 1977, 6-8). These largely involved minor changes to the interpretation of culture-history and the addition of more regional types to the already burdgeoning series, but made little comment of a methodological nature. J. Norman Emerson attempted to introduce methodological refinements to the typological approach. One important contribution was to make explicit some of the assumptions that underlie this approach:

> First, pottery is a sensitive index of cultural interrelationships; second, rim sherds can be systematically typed; third, samples which exhibit a very considerable degree of similarity are more closely related culturally and chronologically than those which do not; and fourth, pottery types show a development which follows a normal distribution curve - that is, [a] ceramic type becomes discernible, acquires a peak of popularity and decreases until it dies out (Emerson 1961, 181-182).

Emerson's interpretation of culture-history and cultural relationships

was, however, based on two implicit assumptions leading to use of the Direct Historical Approach. The first assumption was that the historic Iroquoian societies were homogeneous cultural groups; that is, there was little spatial variation within each group. The second assumption was that this cultural homogeneity could be extended back into prehistoric times by means of the typological method combined with ethnographic analogy through the Direct Historical Approach. In other words, a preconceived assumption about the sociocultural nature of Iroquoian groups was imposed through analogy and without due consideration of the archaeological evidence. The effect of this was to minimize concern with spatial variation of pottery within the area assumed to have been occupied prehistorically by any one homogeneous Iroquoian tribe, and to emphasize instead the interest in chronological order (see also Ramsden 1977, 21).

Emerson introduced two important analytical refinements to MacNeish's approach to pottery typology. The quantification that MacNeish had used was quite rudimentary (MacNeish 1976, 83). Emerson increased its sophistication by using the Robinson-Brainerd coefficient of similarity to quantify the degree of similarity among Iroquoian rim sherd assemblages (Robinson 1951; Brainerd 1951). He also began to examine the variation of individual ceramic attributes (traits) in more detail and more analytically than MacNeish had done. Attributes were studied for historical significance in the manner suggested by Rouse and hence were treated as modes by Rouse's definition. These were largely the same classes of attributes as those isolated first by Wintemberg and then by MacNeish (decorative motif, decorative technique, and rim shape). Emerson continued to rely more directly on pottery typology, however, than he did on his treatment of attributes. He described his

approach to pottery analysis in his Ph.D. dissertation (Emerson 1954) and later in a monograph (Emerson 1956; revised 1968).

Although Emerson continued to be influenced by the Midwestern Taxonomic System, he recognized one of the major methodological drawbacks of this approach to culture classification. In order to isolate taxa of culture, its adherents tended to emphasize internal similarity of the traits defining each of the classes produced, and to separate these classes by sharp formal boundaries. When interpreted in terms of culture history, these boundaries were seen as discontinuities in temporal and spatial variation. This contrasted sharply with the evolutionary perspective of continuity that the proposal of the in situ hypothesis had introduced into Iroquoian studies. Emerson, while continuing to accept the notion of internal homogeneity and spatial separation of Iroquoian groups, attempted to remedy the contradiction between the Midwestern Taxonomic System and the evolutionary perspective by applying the concepts of tradition and horizon (Willey and Phillips 1958). It appears that Emerson initially saw the use of these concepts as a refinement and complement to the Midwestern Taxonomic System. As will be discussed below, however, the tradition-horizon approach gradually replaced the Midwestern Taxonomic System.

The approach that MacNeish and Emerson developed remained predominant in Ontario until about 1965. It was employed by an increasing number of researchers who made substantive contributions to Iroquoian culture-history (e.g. Pendergast 1963; 1964; Wright 1960; 1966). New types were introduced to the series (e.g. Wright 1966), but not all contributions were made within the context of the series that MacNeish had proposed. For example, Ridley (1961) created a separate set of types for the pottery from Neutral sites he investigated, making

it impossible to compare his data with sites for which MacNeish's series had been employed (Wright 1966, 85). This proliferation of types contributed heavily to the dissatisfaction with the typological approach that developed in the 1960s.

In MacNeish's and Emerson's work we see a sharp break with the methodological approaches of Boyle and Wintemberg. The interest in functional interpretation of artifacts was largely replaced with a concern for culture-history. The introduction of seriation switched the emphasis from artifacts to types as analytical entities. This had the effect of limiting research to examination of pottery, indeed rim sherds of vessels, instead of all of the classes of artifacts that both Boyle and Wintemberg had used. In addition, MacNeish and Emerson introduced elements of quantification into their research, as opposed to the almost solely qualitative examinations used by their predecessors.

The objective of the overall approach in Iroquoian archaeology at this time was to produce a viable culture-history of Iroquoian prehistory within the framework of the in situ hypothesis. The general method consisted of ordering the archaeological record (or, at least, the rim sherds in the archaeological record) through typology. The ceramic classes thus produced were further ordered into cultural units using the low level units of the Midwestern Taxonomic System. These cultural units were related to each other chronologically through seriation. The culture-history generated was justified by further use (or abuse) of the Direct Historical Approach and the theoretical assumption that societies tended to organize themselves into discrete cultural units. As more researchers entered the field of Iroquoian archaeology and more archaeological data became available through survey and excavation, however, it gradually was realized that neither the typological approach

as practiced by MacNeish and Emerson nor the Midwestern Taxonomic System did justice to the complexity evident in the archaeological record of Iroquoian prehistory.

Starting in the early 1960s, several significant methodological changes in the approach to Iroquoian studies were suggested and variously implemented, initiating trends that have continued until the present day. To begin with, however, the overall approach of classifying and seriating rim sherds, and organizing cultural units with the objective of producing culture-history remained the same. The important modifications occurred in the realm of the analytical and cultural entities that were used to generate culture-history. Specifically, the typological method as practiced by MacNeish and Emerson as well as the Midwestern Taxonomic System were criticized and rejected.

In addition to greater amounts of data, this period saw a substantial increase in the number of archaeologists studying Iroquoian societies. This led to important substantive contributions too numerous to list here. I will review the work of a limited number of researchers who contributed to methodological development.

As in preceding decades, Iroquoian archaeology in the 1960s was influenced by methodological developments occurring elsewhere. During the second stage of Willey and Sabloff's Classificatory-Historical Period (The Concern with Context and Function [1940-1960]), the whole nature of the archaeological approach to prehistory began to be questioned. Perhaps the most seminal criticism of the traditional approach was published by Walter Taylor (1948). The main thrust of Taylor's critique was that archaeological objectives should not be limited to formulations of culture-history as a study of spatial and

temporal relationships. He argued that the archaeological record was inherently capable of producing important information concerning economic and social-cultural behaviour. To recover and interpret this information, he suggested that archaeologists should adopt an approach that integrated culture-history, traditionally assumed to be the realm of archaeology, with the social and cultural aspects of anthropology. This approach, labelled conjunctive by Taylor, had a number of methodological ramifications relating to both artifact and cultural classification.

The typological method underwent considerable modification in American archaeology in the 1950s and early 1960s. The debate concerning the discovery or imposition of types became more explicit and acrimonious. Ford continued to argue that types are an analytical construct with only temporal significance, while Albert Spaulding became the most outspoken contender that types should reflect more than just chronology (Ford 1954; Spaulding 1953; 1954). This debate has not yet been truly resolved, but most researchers in American archaeology sided with Spaulding (Willey and Sabloff 1980, 145). This can be attributed in part to the influence of Taylor's critique. If archaeological studies should be directed toward objectives in addition to culture-history, then one must have a method of doing so. Taylor espoused the typological approach and Rouse's concept of a type as reflective of cultural significance (Taylor 1948, 130). It is not surprising, then, that other archaeologists paid at least lip-service to this approach (e.g. Ritchie and MacNeish 1949).

One of the more important results of this particular debate was the increasingly analytical and quantitative examination of typology that Spaulding initiated. Whereas Emerson attempted to examine attribute

variation after the typological method had been applied, Spaulding argued that such variation should be analyzed prior to attempting typology, and, indeed, should form the basis of typology (Spaulding 1953). Spaulding suggested that statistical techniques could be used to isolate culturally meaningful attributes or modes, and that recurring clusters of mathematically associated modes should constitute discovered types. A type to Spaulding is:

> ... a class of artifacts exhibiting a recognizable association of two or more independent and culturally meaningful attributes, at least one of which is a physical property of the members of the class (Spaulding 1973, 156).

By association Spaulding means:

> ... the mathematical concept of association, which has to do with the degree to which knowledge of classification in one variable allows one to predict classification in another variable or combination of variables (Spaulding 1973, 153.)

This technique is, in fact, an analytical refinement of Rouse's approach to typology.

In effect, this attempt at refinement swung the emphasis of analysis away from the type per se, and focused more attention on measured variation of individual attributes and attribute variables. It also produced a reaction against the intuitive approach to typology that MacNeish and Emerson had followed. Spaulding described the intuitive approach as follows:

> It is based on careful observation of the collection and an impressionistic assignment of the artifacts to polythetic or monothetic classes called 'types' of artifacts. The observations in turn are based on an intuitive knowledge of human behavior supplemented by comparative and experimental study; more carefully stated, archaeologists are skilled in the recognition of behaviorally significant attributes of artifacts, and they observe the association of these attributes on artifacts. ... Broadly speaking, its results are somewhat too subjective because the high competence

> shown in attribute recognition and functional inference is not matched by a keen interest in the principles of classification and the statistical methods appropriate to the study of class relationships (Spaulding 1976, 59-61).

The reaction against intuitive typology initiated what can be seen as two separate but related developments in approach to artifact classification that occurred in Iroquoian studies in Ontario and the United States respectively. In Ontario beginning in the early 1960s the typological approach was largely rejected by many scholars. In the United States, on the other hand, the trend has been to follow Spaulding in a more analytical approach to typology.

In addition to changes in typological methods, arguments were proposed that the Midwestern Taxonomic System was too rigid and unsophisticated to handle the increasingly detailed and complex data that were being extracted from the archaeological record, or to pursue the archaeological problems suggested by Taylor's conjunctive approach. Willey and Phillips, in an important work entitled Method and Theory in American Archaeology (1958), suggested that, rather than eschewing spatial and temporal elements, a system of cultural classification would do better to incorporate the dimensions of form, space, and time from the outset:

> Our object here is to show that a fundamental, unvarying characteristic of all archaeological unit formulations of whatever magnitude is that they are arrived at by combining three sorts of data: formal content, distribution in geographical space, and duration in time (Willey and Phillips 1958, 17).

Toward this end they proposed a taxonomic system that included archaeological units, as they called them, reflecting all three of these dimensions. The stated objective of the classification is to arrive at culture-historical integration: "... culture historical integration is

both the spatial and temporal scales and the content and relationships which they measure" (Willey and Phillips 1958, 12). Their system consists of two levels of taxonomy. The first level includes a spatial taxonomy (locality, region, area), a formal taxonomy (component, phase), and a temporal taxonomy (local sequence, regional sequence). The second level includes a single integrative taxonomy of horizon and tradition. Of these, the second level integrative taxonomy has been the most influential. Willey and Phillips defined a horizon as "... a primarily spatial continuity represented by cultural traits and assemblages whose nature and mode of occurrence permit the assumption of a broad and rapid spread" (Willey and Phillips 1958, 33), and a tradition as "... a (primarily) temporal continuity represented by persistent configurations in single technologies or other systems of related forms" (Willey and Phillips 1958, 37). This taxonomic system has the advantage of being more amenable to take both spatial and temporal variation into account than is the Midwestern Taxonomic System.

It should be kept in mind, however, that the overall objectives of both systems are basically the same. They both aim to classify culture, in much the same way as typology classifies artifacts. In reality, within both approaches artifact typology and culture classification are inextricably linked by the fact that, no matter what the viewpoint, the cultural classes generated end up being identified through assemblages of types. Oddly enough, the major debates involving typology do not seem to have explicitly affected culture classification in the ways they did artifact classification. Once the cultural reality of types was accepted, the reality of cultural classes was simply assumed.

The beginning of the change to an emphasis on attributes in

Iroquoian studies coincided with the start of what Willey and Sabloff call 'The Explanatory Period' (post 1960) in American archaeology (Willey and Sabloff 1980). Developments that occurred in this time period have been labelled the 'new archaeology' by its followers. Willey and Sabloff (1980, 178-211) describe the changes of this period under the headings of 'The Re-emergence of Cultural Evolution', 'Systems Theory and the Ecosystem Concept', 'Statistics and the Computer', 'Deductive Reasoning and the Positivist Philosophy of Science', and 'Ethnographic Analogy and Archaeology'. Some of the main tenets of the new archaeology may be summarized as follows:

(1) the objectives of the so-called traditional approach (or old archaeology) were limited to delineation of culture-history, and can be characterized as merely descriptive;

(2) the objectives of archaeology should, instead, be directed toward producing explanatory principles of culture process; and

(3) the methods to achieve these objectives should be more explicitly and rigorously scientific.

These are, of course, a more detailed and radical reaffirmation of the criticisms and suggestions made by Taylor (1948).

Although it has been claimed that the initiation of the new archaeology represented a revolution in archaeological thinking (Renfrew 1982), the new archaeology is in fact more a prescription for change than a truly new approach. Though it is argued that archaeological methods should be more rigorous and exact (Watson, LeBlanc, and Redman 1971), much of the suggested revision has simply been uncritically borrowed from natural sciences (Schiffer 1976). The alterations and refinements in methods that have occurred since 1960 may have been influenced and stimulated by the new archaeology, but may just as aptly

be considered a continuation of trends that began before 1960. This is especially true of methods used in the archaeological study of Iroquoian artifacts.

One of the first researchers to reject MacNeish's intuitive typology was Marian White. In a study directed toward examining the local sequence of a number of Iroquoian village sites in the Niagara Frontier area of New York State, she argued that a more refined approach was necessary in order to control the spatial, temporal, and cultural aspects of culture-history (White 1961). Her emphasis on the chronology of a local sequence studied within a restricted area reflected the opinion of many researchers that broad-scale temporal relationships among prehistoric Iroquoian groups had been well established using MacNeish's typological method and seriation of pottery types, and that general spatial relationships were controlled by the Direct Historical Approach. For more fine-grained spatial and temporal control it was thought necessary to study the variation that occurred in the material culture of single Iroquoian communities moving through space and developing over time. This view also reflected the emerging concern with cultural process that was initiated by the growth of the new archaeology in the United States, since it was argued that explanation of why change occurred could be best conducted at the community level (Wright 1967).

In order to refine method and technique, White decided to reject MacNeish's typology in favour of a more detailed examination of the temporal variations of individual attributes and variables from pottery vessels, ceramic pipes, and projectile points. Her reasoning for rejecting MacNeish's types was pragmatic:

> The attribute combinations [of MacNeish's types]

> often were not mutually exclusive categories. Thus the classification of a number of sherds required an arbitrary choice on the part of the classifier among several possible types (White 1961, 9).

The procedure that White used was basically the same as MacNeish's and Emerson's, but substituting attributes for types. Underlying this procedure were several explicit assumptions:

> 1. There are demonstrable differences between the artifacts from sites in a limited area.
> 2. These differences result from both temporal and spatial factors.
> 3. In an area where distances are short and there are not geographical barriers, spatial factors are of secondary importance, so that culture can be considered uniform throughout a small and geographically homogeneous area at any single point in time. ...
>
> Under the assumptions that have been made it would follow ... that the best explanation of the differences in the site-to-site data is that these result from differences in time (White 1961, 6-7).

The implication of White's argument is that, once spatial and cultural factors are controlled, formal variation can be attributed to temporal change. She did not, however, make clear what cultural factors were involved.

White's use of attribute analysis was initially more influential in Ontario than it was in the United States. The rejection of the intuitive approach to typology was championed by one of Canada's leading archaeologists, James V. Wright. In 1966, Wright published an overview of Ontario Iroquoian culture-history that included criticism of both the typological approach to classifying artifacts and the Midwestern Taxonomic System of classifying archaeological cultures. Although much of his treatise was based on MacNeish's typological series, he followed Rouse in recommending that modal analysis replace intuitive typology. He echoed White's pragmatic criticism of MacNeish's types (see also Wright 1967), and added a methodological criticism:

> The advantages of mode analysis over type analysis are conciseness and greater control over the time and space factors; on the other hand, type analysis offers simplicity and more rigid, if artificial, control over the same factors (time and space). As such, both forms of analysis make a contribution at different interpretational levels. However, with reference to Iroquois ceramics, it is felt that mode analysis possesses a greater potential of information and can add a more precise chronology already outlined by rim sherd types (Wright 1966, 17-18).

In addition, Wright suggested that Willey and Phillip's tradition-horizon approach replace the Midwestern Taxonomic System:

> In ordering the Ontario Iroquois materials into a tradition, the earlier Midwestern Taxonomic method of ordering archaeological data (McKern 1939) becomes non-functional. The substitution of the tradition concept for the earlier taxonomic system does not refute the usefulness of the latter but, rather, represents a replacement which is the product of increased archaeological data and thus more sophisticated methods of analysis. The Midwestern Taxonomic system, with its acquired time dimension from the direct historical approach, is a useful system for ordering archaeological data into a meaningful framework when the data are sparse or scattered. With increased archaeological knowledge of an area, however, the continued use of the 'pigeon-hole' categories of the Midwestern Taxonomic system tends to disrupt archaeological continua (Wright 1966, 14).

Wright's reasoning shows the influence of the renewed interest in cultural evolution that characterized American archaeology in the early 1960s. He rejected both typology and the Midwestern Taxonomic System because they were too rigid to reflect continuities evident in the archaeological record. These continuities, he suggested, would be apparent in attribute continua: "Pottery types, like the taxonomic units of the Midwestern system are pigeon-hole units and interfere with attribute continua when sufficient data exist to make such continua meaningful" (Wright 1966, 19). The means of rendering such continua meaningful was to incorporate them into a culture classification scheme,

such as the tradition-horizon approach, that was more sensitive to variation in time and space than was the Midwestern Taxonomic System. The emphasis was not so much on attributes themselves, as on variation in attributes.

Such variation is best seen, by definition, when variables of attributes are examined systematically and the co-variation of attributes is studied, as Spaulding (1973) recommended. In practice, however, the attribute analysis suggested by Wright tended to focus on the frequencies of individual states. In effect, this approach represents a simple replacement of intuitive types with attribute states. Since attribute states were treated methodologically in the same way as the MacNeish's types, there was, in fact, no pervasive change in method. As with the intuitive approach to typology, archaeological significance was ascribed as opposed to being demonstrated.

Although White's and Wright's arguments against the use of MacNeish's types were well-known and persuasive, many Iroquoian researchers were at first wary of changing their methods. James Pendergast, for example, cautiously argued that more practical applications of attribute analysis were necessary before the typological approach was rejected outright (Pendergast 1967, 7). Other archaeologists continued to use the approach that Emerson had proposed for study of Iroquoian culture-history (e.g. Tyyska 1969; Latta 1973), with some adding more types (e.g. Noble 1974). After experimenting with the use of both types and attributes, Pendergast warned that:

> The characteristics necessary for an Iroquoian rim sherd to be designated a particular "pottery type" have been so expanded upon and eroded since MacNeish proposed his pioneer Iroquoian pottery classification (MacNeish 1952), that it is now dangerous to use a

> "pottery type" system of analysis to describe rim sherds. It is the more hazardous because there has been no widespread distribution of the information on which such modifications are based, nor a general assessment of their validity (Pendergast and Trigger 1972, 115).

Because of this, Pendergast decided to use attribute analysis in his studies (Pendergast and Trigger 1972; Pendergast 1973).

Wright conducted an important practical application of attribute analysis in his study of artifacts from the Nodwell site (Wright 1974). His examination of ceramic attribute states enabled him to affirm that: "The attribute trends tend to be independent of one another and, thus, raise serious questions regarding the utility of pottery types except for arriving at very general temporal and spatial relationships" (Wright 1974, 308). Although he did not document this quantitatively, what Wright recognized intuitively was a lack of associated variation among the attributes. This constitutes a statistical argument for the rejection of intuitive types on the grounds that they cannot be duplicated, at least with the materials from the Nodwell site, using Spaulding's quantitative technique.

During the course of his attribute analysis Wright recognized spatial variation among assemblages of pottery vessels from different longhouses on the Nodwell site. Since Nodwell displayed all the characteristics of being a single component Iroquoian site, he assumed a short time span of occupation. With time thus controlled, he inferred that the spatial variation was due to social differences within the village as opposed to temporal variation. He postulated that there were both conservative and progressive tendencies indicated by this spatial variation. Although he did not elaborate on what these tendencies might mean in social or cultural terms, Wright's distinction marks one of the

first attempts in Ontario to use artifacts for inferring social factors.

The implications of social variation in ceramic attributes were recognized by Peter Ramsden in his major study of Huron culture-history. Ramsden followed Wright in rejecting MacNeish's intuitive typology because, he argued, types mask the spatial and chronological significance of variation in individual attributes (Ramsden 1977, 17-18). He also questioned two implicit methodological assumptions underlying the approach to Iroquoian prehistory used by many archaeologists:

> These assumptions are that the primary determinant of the frequency of ceramic traits on Huron sites is chronological variation [see Emerson 1961, 181-182], and that Huron sites can be analyzed as though they formed a single developmental series with respect to ceramics (Ramsden 1977, 28).

He saw these assumptions leading to a misuse of the Direct Historical Approach to control social and cultural aspects of Iroquoian groups, as conducted by researchers such as Wright (1966) and Noble (1968; 1969). He identified three further implicit assumptions upon which attempts to link social and cultural aspects of historic Huron groups with those of prehistoric groups were based:

> ... a) historical accuracy of the documents regarding the nature of these social structures, b) the applicability of these documents to all Huron groups, and c) the necessity for the historic situation to have roots in prehistoric Huron development (Ramsden 1977, 23).

He raised serious objections to these assumptions:

> The prehistoric materials are forced into a historical mold. Prehistoric events are seen as necessarily being simply backwards extensions of events, situations and processes that the explorers and the Jesuits thought they were observing in the seventeenth century (Ramsden 1977, 24).

What Ramsden did not explicitly recognize was that such abuse of the

Direct Historical Approach showed the continued influence of the belief that native societies were inherently unprogressive (Trigger 1980). He suggested that, instead of relying on the Direct Historical Approach, attempts should be made to control social aspects of variation through a method more strictly based on the archaeological record:

> ... I favour a greater reliance on attributes instead of types, and a greater awareness during the analytical procedure of nonchronological causes of ceramic similarity and variation. Attempts should be made to isolate local groups or lineal sequences of sites, and determine their significance for future ceramic analysis (Ramsden 1977, 22).

The assumption implicit in this statement is that nonchronological factors of ceramic variation can be automatically attributed to social causes, and that, once such factors are isolated, they can be ignored if one is simply constructing culture-history. He argued that socially related sites could be delineated through attribute analysis, and that these groups of sites would "... reflect a social and historical reality which is derived from the data, and not imposed on it" (Ramsden 1977, 29). He did not, however, cite any mode of justification or evaluation for this assumption.

By the end of the decade from 1965 to 1975, both attributes as analytical entities and the tradition-horizon approach to culture classification were accepted by most researchers in Ontario. In the United States, however, a somewhat different development occurred in Iroquoian studies during the same time period. As mentioned above, American students of Iroquoian prehistory did not reject the typological method completely, as in Ontario. Instead they attempted to refine it by espousing more analytical approaches to typology. They also attempted to expand the objectives of Iroquoian research to take account of factors other than cultural-historical ones.

A debate arose between Robert Whallon and Albert Spaulding concerning the taxonomic nature of the relationship among the attributes that combined to produce types. Whallon argued that "... long-established typology and seriation are useful and relatively accurate reflectors of temporal and spatial variability ..." (Whallon 1972, 13; see also Whallon 1980, 9). He claimed that Ritchie and MacNeish's approach to typology had, in fact, been taxonomic, as opposed to non-hierarchical, in nature. He suggested that, instead of Krieger's approach to typology, an alternative approach be adopted on the basis of the following two assumptions:

> 1. that there is a hierarchy of importance, and therefore, an order of consideration among attributes considered in the typology, and
> 2. that the criteria for definition shift from one type to the next, depending upon where one is in the process of subdividing along the hierarchy of attributes (Whallon 1972, 15; emphasis in original).

Using a taxonomic statistical technique (monothetic subdivisive clustering) borrowed from plant sciences, Whallon developed a procedure that, he argued, quantitatively duplicated the intuitive process employed by Ritchie and MacNeish. The taxonomic classes so produced, in Whallon's opinion, closely approximated Ritchie's and MacNeish's typological series for Owasco pottery. He evaluated the resulting types by citing the utility of traditional types for seriation. On the basis of such utility, Whallon argued that the taxonomic classes were true discovered types with historical significance and cultural reality (Whallon 1972, 14; Whallon 1980, 13).

Spaulding reacted to Whallon's proposals by criticizing the assumption that utility for seriation demonstrated the cultural reality of taxonomic classes (or any classes, for that matter):

> The utility of such classes derives from including as

> class-defining properties attributes and attribute combinations whose relative frequencies vary systematically in the group of components to be seriated. There is no method of analysis that can identify in advance in a component the classes that will be useful in some subsequent seriation. This kind of utility is identified by actual intercomponent comparison (Spaulding 1976, 67).

He did not, however, question the stated objective of Whallon's research of searching for culturally meaningful artifact classes. Indeed, Spaulding restated this objective in his important assertion that:

> A fundamental problem of archaeology, with ramifications at all theoretical levels, is the description of culturally meaningful artifact assemblages. The goal of description is the economical presentation of the essential properties of the assemblage. We attempt to provide a description that is both simpler than the artifacts themselves and complete with respect to the properties and relationships of the assemblage judged to be culturally significant (Spaulding 1976, 59).

This is, in essence, a statement of archaeological method. Implicit in this statement is the assumption that cultural meaning inherently exists within an assemblage of artifacts, and that this meaning can be extracted and described. Spaulding did not, however, attempt to evaluate this assumption methodologically, nor did he elaborate on what he meant by theoretical levels, or how cultural meaning is to be judged. He proposed that the most effective means of describing artifact assemblages so that their cultural meaning becomes apparent is to apply the concept of a lattice-like relationship of attributes in classes, and to explore the relationships among the attributes through elaborate and sophisticated statistical techniques such as multifactor analysis of association (Spaulding 1976).

Debates concerning the nature of the most efficacious analytical entity continue in both Canada and the United States, and in archaeology in general (see Whallon and Brown 1982). In the late 1960s and 1970s,

however, several American researchers attempted to deal more explicitly with the cultural meaning assumed to reside in the archaeological record of Iroquoian prehistory. Their objective was to proceed beyond culture-history using whatever analytical entity appeared to be the most useful. Robert Whallon and William Engelbrecht, for example, sought to pursue problems of Iroquoian social and political organization (Whallon 1968; Engelbrecht 1974a; 1974b). Whallon argued that the traditional approach to typology is adequate for constructing a spatial and temporal framework, but that attributes and attribute variation are better suited for studies of social and cultural aspects (Whallon 1968). In a study published in 1968, he listed a number of important assumptions that he and Engelbrecht considered necessary for inferring patterns of social organization. Whallon is to be commended for attempting to make his assumptions explicit, but a brief examination will show that he mixed both methodological and theoretical assumptions together without distinguishing between the two. He proposed that social organization could be investigated quantitatively through variation in stylistic elements of attribute variation. This proposition was based on the following two assumptions:

> The first of these [assumptions] is that style has many aspects and levels of behavior which may be analytically distinguished and measured. ... The second assumption ... is that the nature of the diffusion of stylistic ideas and practices, both within and between communities, will be determined by the nature of interaction among artisans (Whallon 1968, 223).

These assumptions actually reside on two distinct levels; the first is methodological, while the second is theoretical. These were used as the foundation for further hypotheses. Considering the theoretical level first, the following, more specific, assumptions were made:

> It was hypothetically predicted that mutual associations among stylistic attributes would tend to be particularly developed on items produced by women in a community with high rate of matrilocal residence (Whallon 1968, 225).
>
> It is assumed that the pottery from these sites in New York was made entirely by women (Whallon 1968, 229).

These assumptions were based on ethnographic analogy, using James Deetz's study of Arikara pottery (Deetz 1965) and historic Iroquoian groups known through the direct historical approach (Whallon 1968, 230). On the methodological level, Whallon assumed further that stylistic elements are recognizable in the archaeological record as specific attributes and variation of these attributes:

> If these attributes then exhibit systematic patterns of behavior [of attributes] which can be related to the influence of social, cultural, or individual factors rather than to factors of function or of the physical environment, both the attributes and their behavior are considered "stylistic" (Whallon 1968, 224).

Whallon, however, does not appear to have recognized the methodological nature or implications of the assumptions concerning style. He stated that:

> The meaning of style has so many ramifications that an attempt at a comprehensive definition must either arrive at a vague, theoretical statement or become involved in an extensive review of specific usages (Whallon 1968, 224).

In this statement, Whallon identifies only a theoretical level and a technical level (specific usages). He did not attempt to evaluate these assumptions in terms of methods of inference, but treated them in the same manner as the theoretical ones. He seems to have accepted Spaulding's implicit assumption that the various levels of meaning he identified (functional, social, and cultural factors) could simply be described through classification.

Since 1975, archaeological investigations of Iroquoian societies in both Canada and the United States have tended to come closer together in approach. Although some researchers continue to use the typological method for classifying artifacts, especially in the United States, attribute analysis has become fairly widely accepted (see Engelbrecht 1978; 1980). The tradition-horizon approach to cultural classification has also come into broad use (see Kapches 1981). Recently, attempts have been made to apply the type or attribute approach to other classes of archaeological data besides pottery, such as settlement pattern (e.g. Smith 1977; Dodd 1984; Warrick 1984; Finlayson 1985b). In addition, more attempts have been made to proceed beyond formulation of culture-history to interpretations encompassing technological function, ecology, and economy (e.g. Finlayson and Byrne 1975; Williamson 1985) and social organization (Warrick 1984; Pearce 1984).

The application of cultural classification and analysis based on individual attributes has been subject to some recent criticism. Warrick (1984) suggested that a societal approach might be more effective for purposes of studying prehistoric social organization, but he continued to employ the tradition-horizon framework established by Wright (Wright 1966). Robert Pearce produced a more detailed and incisive criticism of cultural classification and suggested that the societal approach replace it completely (Pearce 1984). Neither Warrick nor Pearce, however, explicitly discussed the implications of the societal approach for archaeological method and both continued to use individual attribute analysis.

In 1980, James Wright published an article in which he reiterated his criticism of intuitive typology and support for attribute analysis

in an explicit examination of a number of propositions and assumptions. Of note among these is his proposition that:

> Temporal and spatial attribute constellations will be the most effective comparative units for understanding the relationships between the prehistoric cultural developments that terminated in the various historic Iroquoian-speaking peoples of the Northeast (Wright 1980, 25).

In this Wright implied that the individual attribute state is not necessarily the sole analytical entity useful in archaeological analysis. He did not define what he meant by attribute constellations, however, nor did he explore how such entities could be employed analytically. Along the same lines, I conducted an examination of individual attributes as analytical entities for a specific purpose, temporal inference through seriation of pottery, in my M.A. research (Smith 1983). Since this study has become the inspiration and the backdrop for the present dissertation, I will summarize it here.

The overall objective of my research was to develop a method of seriation that could be used to place five Iroquoian sites in chronological order through seriation of ceramic rim sherd assemblages. The main problem faced was not the technique of seriation, since the procedures have been the subject of much discussion (e.g. Brainerd 1951; Rouse 1967; Renfrew and Sterud 1969; Dunnell 1970; Gelfand 1971; Spaulding 1978; Marquardt 1978), but, rather, determining the analytical entities to be used as the basis for the seriation. The controversy in Iroquoian studies concerning the utility of MacNeish's typological method versus the attribute method has been largely reflected in the choice of types or attributes as seriation entities (e.g. Ramsden 1977). This is the result of the overall emphasis on culture-history that has dominated Iroquoian research for the last three decades. While agreeing

with the criticisms levelled against MacNeish's types by Wright and Ramsden, I was concerned about the use of single attribute states alone as seriation entities. It seemed possible that critical information would be overlooked when the relationships among attributes were ignored, relationships that were, at least intuitively, incorporated into MacNeish's typological series.

In order to review the relative utility of attributes and types for seriation, I turned to the work of Albert Spaulding and David Clarke. Spaulding's major contribution was explicitly to define an artifact type (Spaulding 1973), and explain rigorously the relationship of types to seriation (Spaulding 1978). He summarized this relationship as follows:

> Association analysis is irrelevant to frequency seriation. Frequency seriation is a process of discovering systematic transformation of artifact class frequencies from assemblage to assemblage, and the only data needed for this process are the class frequencies themselves. Any set of classes reflecting systematic change will serve for seriation (Spaulding 1978, 38).

The problem, then, in the analysis of assemblages of Iroquoian rim sherd assemblages was to find a set of classes that were suitable for seriation.

For a discussion of analytical entities that could be useful for seriation, I referred to Clarke's Analytical Archaeology (1968). He developed a hierarchy of entities beginning with attribute states and proceeding through attribute variables, attribute complexes, artifacts, types, assemblages and cultures (these are discussed in more detail in the following chapter). The most notable characteristic of this hierarchy is that each successive level of entity is an aggregate of lower level entities.

Next, I tried to use Spaulding's and Clarke's formulations for the

seriation of the five Iroquoian rim sherd assemblages. As a point of departure, I considered MacNeish's types as seriation classes. I have already summarized the complaints about these types made by Iroquoian researchers. I next considered attributes as seriation classes. Wright and Ramsden argue that MacNeish's method should be replaced with what they call modal analysis. This approach involves the study of single attribute states, i.e. the lowest level entity in Clarke's hierarchy. For purposes of seriation, attribute states are examined to determine which are the most sensitive temporally. Temporally sensitive attribute states in this case are technically defined as those that show the most consistent patterns of unidirectional variation through time. In order to test for such sensitivity, it is necessary to have some prior knowledge of the chronology of any set of artifact assemblages being seriated. This is, of course, an obvious inherent drawback. A demonstration of how this method is applied is provided by an example from my M.A. research. The only indication of chronology that I had for the sites was the general cultural affiliation given to them on the basis of the very ceramic assemblages I was attempting to use for seriation. Two of the sites were classed as Middle Ontario Iroquoian and the other three were assigned to the Late Ontario Iroquoian stage (Wright 1966). Ironically, these cultural affiliations were based on MacNeish's types. By comparing the percentages of attribute states from these two groupings, a total of thirteen attribute states were isolated as showing unilineal change between the two groups. From these thirteen attribute states, a total of nine different orders of the assemblages were seriated. This proliferation of orders using attribute states as seriation entities is not an isolated case; the same variety appears in Ramsden's study of Huron ceramics (Ramsden 1977).

For several reasons, then, attribute states are not necessarily useful seriation entities. Firstly, the necessity for prior knowledge of chronology limits the entire approach. If enough is known about the chronology of assemblages through external sources, such as radiocarbon dating, to be able to describe in detail trends in the behaviour of attribute states, there is no need for seriation. If a chronology is assumed, and attribute states that support it are selected, the archaeologist is merely engaging in a circular argument of justification. Secondly, the proliferation of orders generated using attribute states indicates that the assumption of unidirectional variation through time, even of temporally sensitive attribute states, is unjustified. The histograms showing the variation of attribute states that I judged to be chronologically significant in my M.A. research (Smith 1983, 96-103) demonstrate that the temporal variation of such attribute states is relatively complex. In this case, the frequency of occurrence of a number of the attribute states did not follow the simple pattern of increasing to a peak of popularity and then decreasing. In fact, some demonstrated the opposite pattern. This leads to a third reason, which I consider to be the most important and fundamental. Clarke pointed out that, in hierarchy of entities based on levels of emergent information, attribute states occupy the lowest level (Clarke 1968, 145). As such, therefore, they will of necessity supply the lowest return in unexpected pattern and information.

The next step was, therefore, to find a higher level analytical entity that provided more relevant information, and was applicable in the context of Iroquoian pottery. Since MacNeish's typology is not considered to be adequate, I looked into Clarke's hierarchy of entities. After attributes, Clarke fitted in attribute complexes. As I now

realize, the definition of an attribute complex I used my M.A. thesis is different from Clarke's definition. Clarke defined an attribute complex as "... a polythetic set of attributes repeatedly found on individual artefacts within populations of artefacts" (1968, 145). I defined an attribute complex as a combination of attributes observable on a single artifact, and a set of attribute complexes as all such combinations observable within a group of artifacts, without regard for mathematical association. I decided not to deal with types as defined by Spaulding because of his argument that types are not necessary for seriation and because his own attempts at generating types from an Iroquoian ceramic assemblage through multifactor analysis of association were not satisfactory (Spaulding 1976). I ruled out trying the polythetic entity which Clarke had defined as a type because I did not, and still do not, know how to isolate a polythetic set of attributes analytically (discussed in the next chapter). I decided to test attribute complexes, by my definition, because I felt that they would reflect the temporal behaviour of combinations of attributes hinted at by MacNeish's series of pottery types. In order to establish viable attribute complexes, I began with an attribute analysis. I dealt with attribute variables, since the behaviour of attribute states is always included in the variable. I followed Clarke's procedure of separating out inessential, essential, and key attribute variables. Essential attribute variables are those that show some kind of patterned behaviour that is temporally significant; all the rest are inessential to the problem at hand. From the essential variables I separated out a set of key variables, those that appeared to be highly significant temporally. Using the key attribute variables, I tabulated all of the combinations of attribute states of the variables that occurred in the five assemblages and used

these attribute combinations as seriation classes to order the assemblages chronologically.

This exercise led to a number of interesting results. The attribute variables isolated as key temporal entities were 'Rim Form', 'Upper Rim Decorative Motif', 'Upper Rim Decorative Technique', 'Neck Decorative Element' and 'Neck Decorative Technique'. These variables are, in fact, those that formed the basis for MacNeish's typology. The attribute combinations generated using these variables, therefore, incorporated the significant temporal relationships among attributes that MacNeish had recognized intuitively, but which his typological series tended to mask. In addition, an examination of changes in relative frequency of individual attribute states over time, such as those evident for 'Upper Rim Decorative Motif', indicated that the temporal variation of many key attributes by themselves does not follow a regular pattern of increase in popularity to a peak, and then decrease.

The research on seriation of Iroquoian rim sherd assemblages described above led to two conclusions. Firstly, and most apparent, the methods currently being used to analyze Iroquoian artifacts for purposes of chronological seriation, or for that matter for any other purpose, are inadequate. Secondly, since the approach I developed in my M.A. research was useful for inferring temporal significance of certain formal variation in pottery, it should, with development and refinement, also be applicable to other classes of artifacts, and, more importantly, to inference at other levels as well as time.

As the methods employed to study Iroquoian artifacts, especially ceramics, have become more sophisticated and complex, so too has the terminology associated with such study. In a recent publication, Roger Marois makes the important observation that consensus has not been

reached among researchers studying prehistoric ceramics with respect to terms used to refer to various aspects of ceramic decoration (Marois 1984, 120-1). Because of this a certain amount of uncertainty concerning terms such as 'motif' has resulted. Although Marois refers to analysis of pottery, and specifically rim sherds, his comments can also be applied to other artifact classes, including pipes. This terminological confusion is particularly disconcerting when one attempts to identify and select analytical entities, for the terms permute the variable and value names. With the stated objective of remedying this situation, Marois discusses a number of valuable concepts and makes some interesting terminological suggestions. Although I do not agree with much of the terminology that he introduces, I have found many of the concepts he discusses to be very useful and I view his study as a valuable attempt to systematize ceramic analysis. Since the theme of his paper is very germane to the artifact analysis conducted in this dissertation, I will comment on it in the discussion that follows.

As Marois notes, the term 'decoration' itself has various connotations depending who uses it and in what context. Although he states that "Decoration analysis is valid only insofar as the term "decoration" is clearly defined" (1984, 120), he does not explicitly define decoration per se. Instead, he refers to 'alterations worked on vessel surfaces', and 'arrangements of alterations' (1984, 139). Paraphrasing this, Marois seems to define pottery decoration as 'any patterned alteration of a vessel's surface'. He then characterizes decoration as consisting of decorative elements. These decorative elements, in turn, may be either production elements or constituent elements. Unfortunately, there is some confusion concerning what is to be included under the rubric of these terms. At one point he notes that

"... the arrangement of decorative elements can and should be studied separately before being associated with specific tools and motions" (1984, 139), but shortly thereafter states "... it is logical to say that decorative elements comprise production elements (tool, motion and individual alteration) and constituent elements" (1984, 139-40). This seems to be clarified in Marois' definitions of 'production' and 'constituent' elements:

> Production elements designate the surface alterations that may or may not subsequently be arranged and the means employed to execute these alterations whereas constituent elements designate surface alterations which make up the arrangements according to a conceptualized project or plan (1984, 140).

In the above statement, tools and motions are considered aspects of production elements. The reason for a distinction between two kinds of elements, however, is not clear, since it is manifest that both refer to alterations (or markings) on the surface of a vessel. Are there two distinct forms of surface alterations, or do these terms designate different ways of looking at the same alterations? Marois argues that constituent elements, at least, are combined to form what he terms 'aggregates' of elements. These aggregates are, in turn, subdivided into 'arrangements', depending on where they are located on the vessel (i.e. 'upper arrangements' are located on the rim and neck sections, 'intermediate arrangements' are located on the shoulder, and 'lower arrangements' are located on the body of the vessel). These arrangements are subdivided once again into 'essential' and 'accessory' elements of upper arrangements (with accessory elements being further subdivided into 'preponderant' and 'auxiliary' elements), 'dominant' and 'dependent' elements of intermediate arrangements, and 'principal' and 'subsidiary' elements of lower arrangements.

Although it is clear that Marois is making a laudable attempt to refine the terminology of ceramic analysis and make it more precise, the proliferation of terms that he proposes serves, in my opinion, to increase confusion instead of reducing it. He is, apparently, attempting to replace more traditional terms with less ambiguous ones. For example, the phrases 'production elements' and 'constituent elements in aggregates' seem designed to replace the terms 'technique' and 'motif', respectively. Upper, intermediate and lower arrangements refer to rim, neck, shoulder and body decoration; 'essential' and 'accessory' elements (and their various synonyms) are meant to replace 'primary' and 'secondary' decoration. I would argue, however, that in rejecting the traditional terms in toto, Marois has discarded two important benefits of this terminology; namely conciseness and familiarity. I argue further that it would be more beneficial to examine in detail the concepts underlying this terminology, and to propose more precise definitions for terms with which ceramic analysts are already more familiar, and that, indeed, have their own useful connotations. With this in mind, in Chapter 5.0 I attempt to affect a compromise between the more familiar terms and concepts used by past researchers studying Iroquoian ceramics and the terms and concepts that Marois discusses.

2.3 Summary and Discussion

The foregoing historical survey provides an overview of the development of approaches to archaeological artifact analysis that have been followed in the study of Iroquoian societies over the past 100 years. Although this review makes it evident that the growth of Iroquoian archaeology has been quite complex, and subject to diverse influences, some important trends can be recognized. As the importance

of patterns of similarity and difference in the archaeological record became clearer, researchers gradually became more concerned with methods for dealing with this variation. Changes in methodological approach have been most directly reflected by the nature of the archaeological entities that have been used to investigate patterns of variation. In fact, I see the development of methods of Iroquoian artifact analysis falling into four general stages based on the archaeological entities that were most popular in each:

(1) a speculative stage dating from the first contact of Europeans with Iroquoian societies until about 1875 during which no archaeological data were employed;

(2) an artifact based stage dating from approximately 1875 to 1945;

(3) an artifact type based stage dating from 1945 to 1965; and

(4) an attribute based stage dating from 1965 until the present.

The methodological trends apparent in each of these stages will be discussed briefly below.

During the time when speculation formed the basis for interpretation, little or no attempt was made to deal with the archaeological record. As a result there were, in effect, no archaeological methods, and, therefore, no methodological assumptions. There arose, however, a number of important theoretical assumptions based, apparently, on the prevailing attitude toward native peoples as unprogressive. It was implicitly assumed that temporal factors were unimportant, and other variation (spatial, economic, social, and cultural) was ascribed to ethnic differences and migration.

During the following stage, the potential of the archaeological record was recognized and methodological assumptions gradually began to emerge. Although they were well aware that other factors existed, Boyle

and Wintemberg assumed that the basic objective of artifact analysis was the ordering of artifacts into classes to which functional significance could be ascribed. Because of this emphasis on one dimension, the artifact itself was seen as the most elementary analytical entity.

It is important to note that the main theoretical assumptions that Boyle and Wintemberg inherited from the speculative stage remained largely unchanged. They conducted their research under the umbrella of a migration hypothesis they saw no need to question. As a result, the dominant concern was with functional study to the detriment of other research questions. The dimensions of space and time were considered to be under control. More complex social and cultural aspects were basically ignored, probably because it was considered impossible to retrieve information concerning them from the archaeological record. The following characterization of Harlan Smith's work may be applied to the whole period: "Smith's classification dealt fairly systematically with subsistence and material culture, but with only selected aspects of ideational culture and scarcely at all with social organization" (Trigger 1978c, 9). This may be called naive functionalism (Trigger 1978c), in which functional studies were conducted without concern for historical or social-cultural context.

Fairly substantial change in methodological assumptions occurred in the next stage with the introduction of the typological approach and the in situ hypothesis. There was a rather abrupt switch in objective from functional to temporal inference, brought about largely because of the time depth inherent in the in situ hypothesis, but also because of direct influence from American archaeology. It was assumed on the basis of Rouse's and Krieger's arguments for the historical significance of

types that discovered types were the most useful analytical entities for inferring the temporal dimension. The utility was based on the further assumption that the variation of types through time was regular, other factors being controlled.

By contrast, the shift in explanatory model that occurred was not as dramatic as it appeared on the surface. The in situ hypothesis was, like the southern hypothesis, a means of dealing with culture-history, and did not go beyond a concern with space and time. The tribal units that MacNeish used as the historical anchors for his seriations were basically the same as Wintemberg's Iroquoian foci. The Midwestern Taxonomic System did not suddenly become obsolete, but remained influential for quite some time. There was no real concern with function, social organization, or cultural context; these were considered to be controlled through analogy by means of the Direct Historical Approach.

Finally, during the most recent stage we see changes in both methodological and theoretical assumptions. To begin with, however, the change was minimal, and may be best characterized as a gradual increase in the complexity of assumptions. The arguments proposed for replacing types with attribute states and the Midwestern Taxonomic System with the tradition-horizon approach did not entail methodological changes, but simply a change from one analytical entity to another, and one system of cultural classification for another. Wright argued that for purposes of general studies of spatial and temporal variation the typological approach was quite adequate. Since much of the research being conducted in the 1960s and early 1970s remained concerned with culture-history, it is not surprising that archaeologists were somewhat reticent to adopt an alternative analytical entity. In reality, attribute states have been

employed, for the most part, using the same methods and for the same purposes as types. In fact, the form of attribute analysis used most often in Ontario is different from that employed by Wintemberg or MacNeish only in the level of quantification used. The assumptions associated with both typology and the Midwestern Taxonomic System as described above were simply transferred to attribute states and the tradition-horizon approach. For example, it was assumed by White, Wright and Ramsden that the pattern of variation of individual attribute states would follow the same regular pattern (increase in relative frequency to a peak and then decrease) as that explicitly assumed for types by Emerson (1961, 181-182).

Both the methodological and theoretical assumptions inherited from previous periods began to come under limited scrutiny only after the arguments of American archaeologists concerning the limitations of culture-history began to filter into Iroquoian research. This has been reflected in attempts to deal with ecological-economic, social, and cultural factors in recent research, and in Ramsden's questioning of the Direct Historical Approach. Assumptions have not, however, received widespread examination, with Robert Whallon's work being a notable exception.

I argue that the methods discussed above have been directed toward elucidation and control of variation in terms of what have been variously termed factors, aspects, dimensions, or levels of meaning. Again and again we have seen these factors identified in the following terms: form, space, time, technological function, economy, social organization, culture. Underlying the approach to these factors have been a number of emerging methodological assumptions that have determined the nature and mode of use of analytical entities employed in

research. The methodological approach has also been greatly influenced by a number of theoretical assumptions that have been reflected most explicitly in frameworks of cultural classification and the arguments used to justify them.

In my opinion, meaning in terms of any of the factors listed above has largely been ascribed as opposed to being documented through formulation and testing of inferences. One major methodological aspect that should be conspicuous in its absence is a valid and distinctive archaeological means for testing the assumptions produced through inference in any dimension. Such evaluation has been attempted in Iroquoian studies by researchers using ethnographic analogy, especially the Direct Historical Approach. In the following chapter I will examine more of the assumptions underlying the methods of archaeology, and, in this broader context, attempt to develop a means of evaluation that can be employed within the setting of Iroquoian studies.

CHAPTER 3.0

Theoretical and Methodological Considerations

3.1 Introduction

The present study was initiated, as was noted in Chapter 1.0, to investigate a perceived spatial anomaly that appeared to occur in the assemblages of ceramic artifacts from the Crawford lake area of southern Ontario. A detailed formulation of the substantive aspects of this archaeological problem will be presented in the following chapter. In this chapter I wish to consider some of the theoretical and methodological factors that underly the investigation of such a problem. Such an explicit examination has two purposes:

(1) to promote economy of effort by ensuring that theory and method are clear in the mind of the researcher before the initiation of an investigation of data, instead of having them develop during the course of such an investigation, and

(2) to allow other researchers to examine critically the theory and method to determine if the researcher's formulations are logical and consistent, and to determine if the researcher has pursued his formulations logically and consistently during the course of the investigation.

Obviously, the archaeological study of prehistoric Iroquoian societies has not been pursued in isolation from the rest of the archaeological world. Researchers from Boyle to Wright have studied and benefited from the work of many other archaeologists with different orientations and from different areas. This process will certainly be carried on in this dissertation. It is not my intention to attempt to introduce a standardized approach or regimented definitions or to argue

that my formulations should necessarily be accepted by Iroquoian researchers or the archaeological community in general. Rather, I wish to establish a systematic course of inquiry for the research problems pursued in this study.

It is clear from the overview presented in the preceding chapter that various changes have occurred in the tradition of archaeological research and archaeological methodology employed in the study of prehistoric Iroquoian societies over the past 100 years. There have been various theoretical and methodological debates in the history of Iroquoian research. Such debates are necessary and stimulating, if at times acrimonious. They have led to important theoretical and methodological innovations, such as the introduction of the in situ hypothesis (MacNeish 1952) and the critical re-examination of traditional typologies (Wright 1967).

It is also apparent that new directions in research are being recommended by archaeologists studying prehistoric societies in northeastern North America. Researchers are no longer content to use archaeological data simply to generate spatial-temporal reconstructions. Finlayson and Byrne (1975), for example, have initiated studies of changes in settlement and subsistence practices that occurred among Iroquoian societies that inhabited the Crawford Lake area. Whallon (1968), Engelbrecht (1974), and Warrick (1984) have attempted to investigate social change in Iroquoian prehistory. These examples of research show the influence of the call for a critical review of the objectives of the discipline of archaeology made by Taylor (1948) and, more recently, by Binford (1968). In fact, much of the theoretical literature published within the last two decades has been, in one form or another, directed toward this problem and the call for review has

become a hallmark of the new archaeology. For example:

> Under the more traditional approaches, it had been argued that the archaeological record limits the kinds of information which the archaeologist might refer to characteristics of past culture. The new archaeologists argued that the discipline had not even begun to explore the archaeological record nor assess its potential for yielding information about the past, since all traditional methods for making inferences had been derived from limited paradigmatic expectations regarding culture (Binford and Sabloff 1982, 407).

In the eyes of some researchers this change has been seen in terms of paradigm change, following Kuhn (1970). Although there has been much impassioned debate, there has been little if any agreement in this area, especially when it comes to details. In order to deal with this problem, it is necessary to examine the objectives of archaeology in some detail so that the objectives of this dissertation may be framed within a broader context.

3.2 Objectives of Artifact Analysis

David Clarke proposed a set of objectives that serve as a useful starting point:

> (1) First, the definition of the fundamental entities that pervade the diverse material, their elements, structures and patterns, the processes that operate on them, and the effects of the processes on the dimensions of space and time. A study in statics and dynamics going beyond particular instances.
>
> (2) Second, the search for repeated similarities or regularities in form, function, association, or developmental sequence amongst the particular entities from every area, period and environment.
>
> (3) Third, the development of higher category knowledge or principles that synthesize and correlate the material at hand whilst possessing a high predictive value. The development of increasingly comprehensive and informative general models and hypotheses (Clarke 1968, 20).

This statement recognizes three levels of archaeological objectives.

These levels can be summarized under the headings of (1) empirical observation, (2) classification, and (3) explanation. These levels are commonly recognized by archaeologists in one form or another, but, apparently, very little headway has been made toward establishing the relationships among them in any systematic format. Prior to the advent of the new archaeology in the 1960s, the first two levels, empirical observation and classification, received most attention, although both Taylor (1948) and Willey and Phillips (1958) attempted to focus attention on the third level. The level of explanation was limited, for the most part, to cultural-historical reconstructions. Recently, however, explanation has received much more attention as an objective of archaeology. Explanation, in fact, has been termed the most important objective of archaeology, and has become one of the most controversial subjects in the archaeological literature. In a recent article entitled "Explanation Revisited" Renfrew (1982) reviewed a number of the forms of explanation that have been employed by archaeologists in recent years. His conclusion in this extremely lucid overview is that the development of scientific explanation within archaeology "... is thus far incomplete, inadequate, and some cases, unsound" (Renfrew 1982, 22). In attempting to propose some direction for future consideration he recognized two forms of development of archaeological explanation:

> One possible conclusion is that archaeology needs to be more willing to generalize. There is some measure of agreement that good processual explanations must consist of propositions that are more widely applicable than to the single case in hand. It would seem to follow then that there should be a systematic attempt to formulate and apply propositions to a wide range of cases. ...
>
> I am aware, of course, that this conclusion runs counter not only to the historiographic and structuralist schools of thought, but to others who seek 'hermeneutic' explanations. It must simply be recognized that there are two different paths here -

> one toward the general and hence the comparative; another toward the specific analysis of context and hence ultimately to the unique.
>
> My own preference is for the former ... (Renfrew 1982, 21).

As Salmon (1982, 7) points out, however, many acceptable archaeological explanations have been produced by researchers for many years. The debate over archaeological explanation has, perhaps, concentrated too heavily on the structure of an explanation without due consideration of its content and the means for confirming it. In addition, the integration of explanation with the other levels of objectives identified by Clarke has rarely been taken into account. For purposes of this study, one of the goals of which is to produce an archaeological explanation, I wish to examine the articulation of all three levels of objectives in more detail.

In considering the first of Clarke's formulations we are dealing with the empirical subject matter of the discipline of archaeology. Both Albert Spaulding and David Clarke are of the opinion that artifacts constitute the basic subject matter of archaeology:

> It seems quite clear that the subject matter of archaeology is artifacts, using this term in its broadest sense as any material expression of human cultural activity... (Spaulding 1960, 24).

> If archaeology is the discipline concerned with the study of past material culture then artefacts are the archaeologist's main data even though other specialists may supply him with complementary evidence on fauna, flora, dating and the like. The archaeologist's facts are artefacts and the information observed about their contextual and specific attributes. ...The fundamental property of the data is that it is observed or perceived information based on attributes of the artefacts (Clarke 1968, 13).

Many definitions of the term 'artifact' have been proposed by various researchers, but with little consensus as to which is the most useful. These definitions range from highly inclusive (such as those of

Spaulding and Clarke quoted above), to highly exclusive, depending on the particular methodological approach of the researcher. The methodological assumption behind the varying degrees of inclusiveness or exclusiveness is, of course, that the entities within the definition must be examined using methods different from those used (if any are used at all) to examine entities not included within the definition. As such, detailed examination of any definition of artifact is necessary, not strictly for purposes of arguing whether it is correct or incorrect, but in order to consider its methodological ramifications.

I propose a definition that is totally inclusive in terms of empirical subject matter, and exclusively archaeological in terms of the methods of examination it requires. To refine this somewhat further, I employ a slight modification of Clarke's definition of artifact: 'any material (instead of any object) modified by a set of humanly imposed attributes' (see Clarke 1968, 134). In this sense the definition is virtually identical to Dunnell's definition of artifact: "... anything which exhibits any physical attributes that can be assumed to be the results of human activity" (Dunnell 1971, 117). The term 'attribute' has also been the source of much ambiguity; here I will define this term simply as 'a trait or characteristic' and return to the subject in greater detail in a later section.

This definition is different from views of artifact that are prevalent in many archaeological circles, including Iroquoian studies, where the term 'artifact' is most commonly employed to describe portable objects, such as rim sherds or projectile points, as opposed to non-portable manifestations such as hearths or storage pits. This exclusive treatment arose because portable and non-portable forms of evidence of human behaviour were treated in different ways. For

example, artifacts were subjected to typology, whereas features were simply mapped. The definition proposed here includes non-portable material manifestations of human behaviour such as hearths and post moulds, inclusively termed features. Hearths and post moulds, however, also demonstrate humanly imposed attributes, and should, in my opinion, be treated methodologically in a manner identical to all other evidence of human behaviour. The differences between projectile points and hearths lie in their specific attributes. Hence differences in the methods employed to examine such artifacts may be a result of confusion about how to deal with artifacts and attributes in general.

Unfortunately, this material evidence is not a direct reflection of the human behaviour that produced it; instead it is static and contemporary. As Michael Schiffer and Lewis Binford state:

> ... archaeological remains are not in any sense a fossilized cultural system (Schiffer 1976, 11).
>
> The archaeological record is a contemporary phenomenon. It is above all a static phenomenon. It is what remains in static form of dynamics which occurred in the past as well as dynamics occurring up until present observations are made (Binford 1975, 23).

If this is the case, then some process must be employed to link artifacts with human behaviour. This process has been termed middle range research by Binford:

> If one accepts observations made on the archaeological record as contemporary facts along with the idea that such facts are static, then clearly basic problems for the archaeologist include (a) how we get from contemporary facts to statements about the past, and (b) how we convert the observationally static facts of the archaeological record to statements of dynamics. Both of these problems pose the question of meaning. ... In approaching this problem, we must develop ideas and theories (middle-range theory) regarding the formation processes of the archaeological record (Binford 1977, 5).

The means by which this process of middle range research is accomplished are inferential:

> ... all knowledge of the dynamics of the past must be inferred ... (Binford 1981, 22).

> Any statement that confers meaning in historical terms to the observations made on the archaeological record is an inference. The justifications for such an inference must be robust arguments that link the properties observed (static matter) to the properties inferred (dynamic conditions) (Binford 1982a, 131-132; emphasis in original).

Although Binford does not here discuss the methods through which empirical properties can be matched with unobserved (inferred) properties, such methods have been a concern of archaeology for many years. As can be seen in the previous chapter, the methods that archaeologists have used revolve around organizing variation in the archaeological record through classification, connecting the analytical entities generated through classification to human behaviour by means of inference, and evaluating the inferences thus produced. This is, of course, Clarke's second level objective of archaeology.

One of the main concerns at this level is with archaeological classification. I do not intend to review all of the work that has been published on classification, either general or archaeological, since the literature is vast and complex, but will concentrate on relatively recent work. Archaeological classification is especially relevant to Iroquoian studies for, as outlined in the previous chapter, the debate over classificatory entities, types and attributes, has been very important.

An examination of recent work concerning archaeological classification reveals that there is still much debate over the nature of archaeological entities to be employed to characterize the

archaeological record. For example, in a recent volume of papers on archaeological typology (Whallon and Brown 1982) there emerges a controversy over the nature of types. Spaulding (1982) argues that types consist of clusters of attributes, whereas Hodson (1982) argues that types consist of clusters of items or objects (i.e. artifacts). Such debate is not trivial, for an adequate understanding of archaeological entities is surely critical for successful analysis of artifacts and the explanation of the archaeological record. This debate underlines the fact that such an adequate understanding has not been reached. Perhaps a renewed look at the nature of archaeological entities could aid in resolving this issue.

As a point of departure let us consider David Clarke's formulation of a hierarchy for archaeological entities. In Analytical Archaeology, he discussed a set of "... successively more complex entity levels" (Clarke 1968, 145). At the lowest level we find attribute states: "... alternative values or qualities of an attribute which may be found at that attribute's locus" (Clarke 1968, 145). This leads us to the next level, the attribute: "... a logically irreducible character of two or more states, acting as an independent variable within a specific artefact system" (Clarke 1968, 145). Following the attribute, we have a rather nebulous entity called the attribute complex: "... a polythetic set of attributes repeatedly found on individual artefacts within populations of artefacts" (Clarke 1968: 145). Clarke defines an artifact as: "... any object modified by a set of humanly imposed attributes" (Clarke 1968, 134). Next we encounter higher level entities: first, the type: "... a homogeneous population of artefacts which share a consistently recurrent range of attribute states within a given polythetic set" (Clarke 1968, 198); second, the assemblage: "...

an associated set of contemporary artifact-types" (Clarke 1968, 230); and then the culture: "... a polythetic set of specific and comprehensive artefact-types which consistently recur together within a limited geographic area" (Clarke 1968, 232). There are other intermediate entities that Clarke inserts among type, assemblage, and culture (e.g. subtype, culture group), but these are variations on the same definitions and need not concern us here.

There are several aspects of Clarke's model that I find attractive and that ~~have aided~~ me in my attempts to deal with analytical methods. First of all, I agree wholeheartedly with Clarke's assertion that all operations and entities employed in archaeological analysis should be examined critically and defined explicitly (Clarke 1968, 3-40). Secondly, his formulation of a hierarchy of analytical entities seems to me to be a valid context for establishing the relationships among these entities. Thirdly, the aggregate nature of successive levels of entities that are proposed enables the researcher to proceed in a step-by-step mode of analysis that is, in and of itself, logical and explicit. Fourthly, Clarke stresses that each successive level of entity and the relationships among these entities demonstrate successively higher levels of information content. In fact, it appears that his levels of entities may be defined by the nature of the information that they yield. As Clarke himself states:

> One important corollary of the aggregate or composite nature of archaeological entities is that such populations exhibit their own specific 'behavioural' characteristics which are more complex than the simple sum of the characteristics of the components and more predictable than that of the individual components (Clarke 1968, 132).

It is with the actual entities and the purposes for establishing them that I disagree. Clarke has an overriding concern with the concept

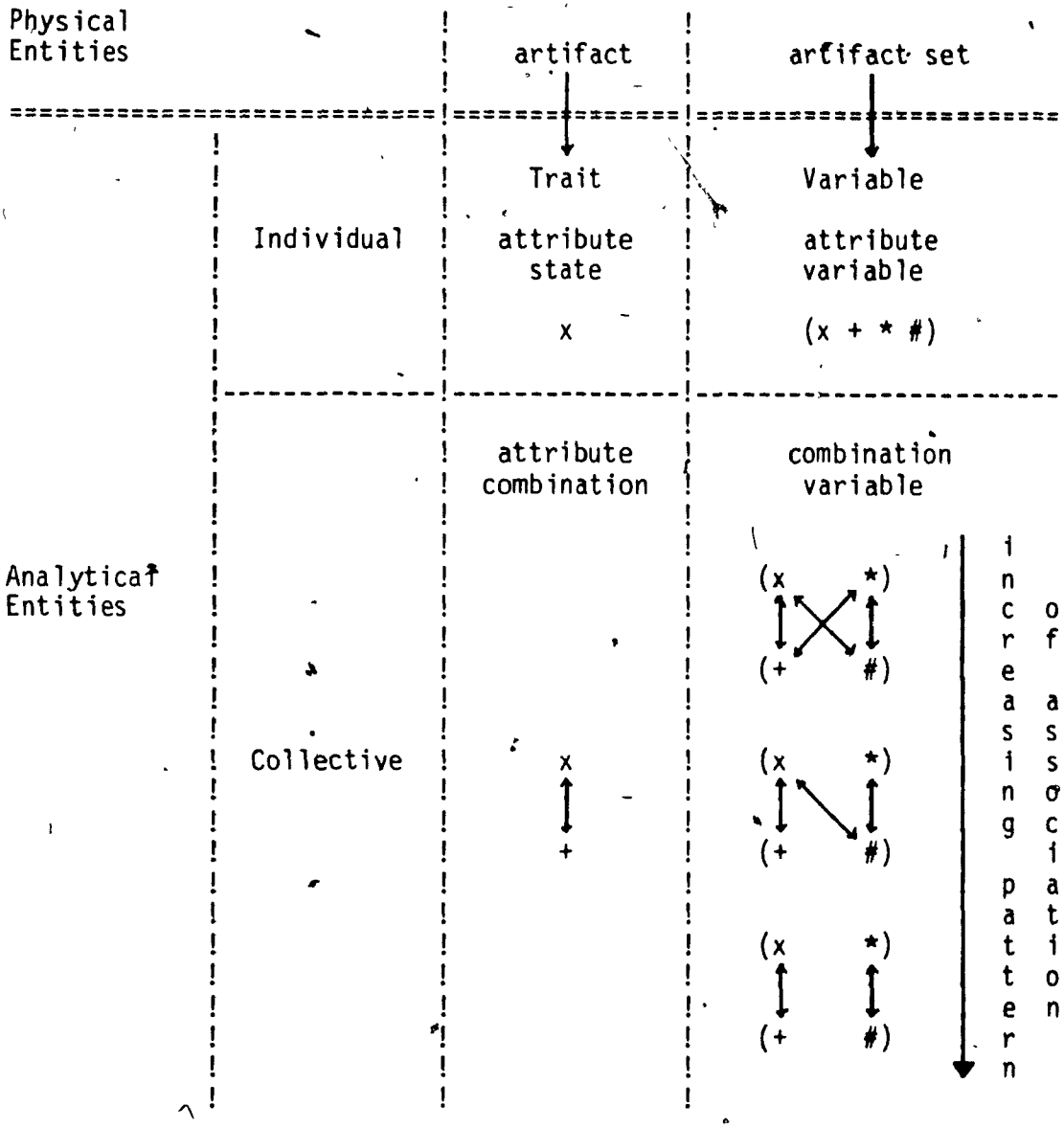
of the archaeological culture, which he sees as the most important entity. He argues that his particular model could be characterized as a logical progression from lower level entities to higher level ones, a progression that naturally leads to the archaeological culture. It appears to me, however, that what he really does is the opposite: he assumes that the culture is of paramount importance, then proceeds to define his lower level entities on the basis of this assumption. This may explain why he forces entities of different categories, kind, or levels into his hierarchy, and why he insists that the higher level entities (type, assemblage, culture) are polythetic. At the lower levels of the hierarchy he includes physical objects (artifacts), characteristics or traits of physical objects (attribute states), and variables of these characteristics (attribute variables) without acknowledging the differences in kind or category among them. I argue that, given a broad enough set of criteria, any population of artifacts could be forced into a polythetic set, and, therefore, could be included in Clarke's hierarchy.

In order to resolve the confusion created by the search for archaeological entities, I argue that a number of fundamental distinctions should be established. Detection and description of patterns of variation in the archaeological record involve classification in terms of archaeological entities. Dunnell (1986a) has recently suggested a distinction between two levels of archaeological entities that he termed empirical and theoretical units. For purposes of this study, I prefer the terms physical and analytical entities respectively, because I believe these more thoroughly capture the methodological import of the distinction. On the one hand, we have physical entities, artifacts, and groups or sets of artifacts. On the

other, we have analytical entities which form the basis of grouping artifacts into sets in terms of pattern of variation. This distinction was noted by Rouse (1972, 48-49), when he pointed out that classes are groups of artifacts, while types are the means by which these groups are differentiated. Artifacts and sets of artifacts are, therefore, the carriers of similarity and difference. Analytical entities are used to describe this similarity and difference. As such, these two levels of entities should not be included in one simple hierarchical model, as Clarke has done, since this confuses physical entities with analytical ones. Physical entities exhibit variation and similarity in all dimensions at once, and are, therefore, naturally inclined to be polythetic. Analytical entities are formulated to describe differences and similarities in one dimension at time, and, in order to be analytically applicable, must be monothetic. In my opinion, this distinction resolves the object-clustering versus attribute-clustering debate mentioned above (see Spaulding 1982; Hodson 1982; Cowgill 1982). Object-clustering occurs at the plane of physical entities, whereas attribute-clustering occurs at the plane of analytical entities. Elements of both procedures, then, are applicable. While it is impossible to divorce analytical entities from physical entities, it must be recognized that there is a fundamental distinction between the two. The relationship between physical and analytical entities will be discussed further below.

We can now examine analytical entities more closely (Figure 1). I have argued that we can distinguish between two categories: (1) observed characteristics or properties, and (2) sets or variables of these observed characteristics or properties. These relate logically back to the physical entities or artifacts and artifact sets from which

Figure 1: Physical and Analytical Entities of Archaeology



they are derived: observed characteristics or properties relate to artifacts, while variables of these traits can be formulated only from sets of more than one artifact, and, therefore, relate to artifact assemblages. I have argued further, following Clarke (1968), that these levels yield different kinds and amounts of relevant information, and must be treated in different ways. In addition, I have distinguished between two levels of analytical entities, that I loosely describe as individual and collective. In Figure 1, the analytical entities of archaeology and the relationships that I see operating among them are illustrated diagramatically. The symbols (e.g. 'x + * #') represent attribute states, and the arrows represent correlations among them. The most basic of all the analytical entities is the attribute state: a single, observed characteristic or property of an individual artifact. From sets of artifacts we can formulate the attribute variable: the set of attribute states that represent the alternatives that were available to choose from during manufacture or use of the artifact. The values of an attribute variable are determined by tabulating all of the attribute states in an artifact set that can be included in a logically irreducible set. An example of an attribute variable is 'rim form' of a ceramic pot; in an Iroquoian context, it can have the alternative values of 'collared' and 'collarless'.

Attribute states and attribute variables make up the analytical entities that I have termed 'individual'. The first category of entity at the 'collective' level is the attribute combination: a single observed combination of two or more attribute states from an individual artifact. An example of an attribute combination is a concave exterior profile of a rim sherd occurring with a convex interior profile.

The second category of collective entity is what I call the

combination variable, for want of a better term. This variable has as its values all of the individual attribute combinations that are observed in a set of artifacts when two or more attribute variables serve as the restricting criteria. An example is all of the observed correlations of exterior profile of a rim sherd with interior profile. It should be emphasized that the values of combination variables consist of only the observed combinations, not all of the logically possible permutations of a correlation of two variables. As can be seen from Figure 1, I have included three distinct patterns of combination variables. These represent various levels of association that can occur in the variable. The first pattern is one of zero, or random, association, where every attribute state has an equal chance of being combined with each of the other states. The bottom pattern is one of complete association, where one attribute state is always combined with one, and only one, other attribute state. The middle pattern represents the various degrees of association that can occur between the two extremes.

The next step is to discuss how we proceed from an organization of the material subject matter of archaeology to linking systematically it with the human behaviour that produced it. It is necessary to formulate a method to attach meaning in terms of human behaviour to the archaeological record. As noted by Binford in quotations above, the linking process is generally known as archaeological inference.

Archaeological inference may be defined, following Binford, as 'the process of linking static material with dynamic conditions'. But how is this linking accomplished? Robert Whallon makes the following statement concerning the inferential nature of typology:

> ... we seldom, if ever, theoretically see typologies

> as based ultimately in the specific variables used in analysis, but rather on one or more underlying dimensions of variability. ... Conceptually, ... it is important to distinguish between variables in terms of which we measure and describe archaeological materials and dimensions which underlie our typologies (Whallon 1982, 130; emphasis in original).

Read also expresses an opinion about archaeological dimensions in the context of a discussion of artifact types:

> Such a (potentially) divisible unit [a traditional artifact type] measures a variety of dimensions simultaneously (e.g. stylistic as it relates to cultural affinity, functional as it relates to normative assumptions about efficiency of technology, temporal as it relates to processual development of a society as a system). Thus, the artifacts that are class members of such a unit are also differentiable along the scales of values for these several (stylistic, functional, etc.) dimensions, and the unit itself can measure only gross characteristics that are common to all these dimensions. This situation defeats at the outset the goal of a fine analysis. The primary methodological problem, then, is to ensure that the finest classes in a classification can be treated as units measuring a single state on a dimension. And it is precisely here that present typological and classificatory schemes are inadequate (Read 1982, 59-60).

The ramifications of the statements by Whallon and Read are that archaeological inference has something to do with a limited number of dimensions that usually include spatial, temporal, functional, social, and symbolic relationships. It is important to note that these are the same as the factors, aspects, dimensions, or levels of meaning that were identified as important in Iroquoian research in Chapter 2.0. At this point it is necessary to turn to a discussion of archaeological dimensions.

One of the first researchers to deal with the dimensions of archaeology was Spaulding. In his article on the dimensions of archaeology, Spaulding stated that: "... sciences can be thought of as studying the interrelationships of the dimensions appropriate to their

specified subject matter" (Spaulding 1960, 23). He defines a dimension as "... an aspect or property of the subject matter which requires its own special measuring device" (Spaulding 1960, 23). With this in mind he argued that "... archaeology can be defined minimally as the study of the interrelationships of form, temporal locus, and spatial locus exhibited by artifacts" (Spaulding 1960, 24). In other words, the dimensions of archaeology are form, space, and time, with the general relationships among these being non-hierarchical (see also Willey and Phillips 1958, 17).

Spaulding's formulations were quite important for his time, and remain so in principle because of his explicit concern with the parameters of archaeological explanation and its methods. The term 'dimension', however, or more precisely, the way that Spaulding defines this term, is taken from the physical sciences. He completed the borrowing by accepting the three physical dimensions of form, space, and time, and suggested that these dimensions are appropriate for the study of artifacts, the specified subject matter of archaeology. The non-hierarchical relationship among these dimensions may have influenced, or been influenced by, Spaulding's argument that the relationship among attributes as elements of a typology is also non-hierarchical (Spaulding 1953). This formulation of dimensions put into words what most archaeologists appear to have implicitly, and complacently, accepted:

> Accepting Spaulding's minimal definition of what archaeology is, we can go a step further and specify its aim as the explanation ... of the order we observe in the archaeological record. Archaeological theory consists of propositions and assumptions regarding the archaeological record itself - its origins, its sources of variability, the determinants of differences and similarities in the formal, spatial, and temporal characteristics of artifacts and features and their interrelationships (Binford and Binford 1968, 2).

In 1980 substantive changes in Spaulding's paradigm of dimensions were suggested by Jean-Claude Gardin. In an analysis of intellectual processes of archaeology, Gardin proposed some very interesting formulations concerning the articulation of dimensions. He distinguished between two levels of archaeological processes:

> A number of them [archaeological processes] are related to the acquisition and manipulation of material objects ...: excavation practices, survey methods, sampling techniques, conservation methods in situ or in the laboratory, etc. Then come the mental operations by which the archaeologist moves from the perception of the collected data to the formulation of verbal statements concerning them, on various levels: chronological or geographical attributions, reconstitution of historical events, inferences about social organization, about the economy, religious behaviour, technology, etc. ... (Gardin 1980, 5).

The link between these two levels is typology, defined as:

> ... any classification of material remains used as the basis of inferences relating to facts that are not included in the initial representation of those materials (Gardin 1980, 63).

Typology connects the material percepts with mental concepts through a process of inference with reference to a set of attributions or dimensions. This process involves isolating extrinsic properties of the objects that are not available to simple perception:

> The characteristic of typological constructions ... is that the final classification is determined by attributes that were not present in the initial representation of the materials. Attributions of Time ..., Location ..., and Function ... have been introduced after the materials had first been described in terms of their immediate physical properties; they were in each case the outcome of operations related to the terms of these descriptions, but which called on hypotheses or data external to the latter ... (Gardin 1980, 65).

Gardin defined Time, Location, and Function as follows:

> ... Time, i.e. chronological indications of all kinds, concerning various phases in the history of archaeological objects (genesis, transformation,

> disuse, re-employment, etc.)
> ... Location, understood in a broad sense, so as to include not only spatial or geographical attributions proper (toponyms), but also affiliations to anthropological entities of various sorts (creators and manufacturers: workshops, schools, societies, cultures, etc.)
> ... Function, also understood on several levels: physical or material (e.g. destination of a tool), sociological (e.g. allotment of edifices or rooms to different activities: political, religious, etc.), ecological (e.g. adaptation of sites to environmental constraints), symbolic (e.g. meaning of iconographical representations), etc. (Gardin 1980, 68).

Gardin's arguments are much more complex than Spaulding's formulation of a simple, non-hierarchical articulation of form, space, and time and the concepts are not treated in the same way. Gardin referred to space and time coordinates in conjunction with the human entities under study as dimensions for purposes of distinguishing among diverse fields of archaeology (e.g. archaeology of South America, prehistoric archaeology, Islamic archaeology). The articulation of Location, Time, and Function quoted above is, however, a formulation of a different order. In the latter case, time and space, with the addition of function, take on a dynamic role as elements in a process of explanation that involves inference of pattern from the empirical subject matter through the medium of relevant classification (typology). The empirical subject matter consists of what Gardin terms intrinsic properties: the physics of objects, the geometry of objects, and the meaning or 'semiotics' of objects (Gardin 1980, 68). This level is basically equivalent to Spaulding's formal dimension. The second level consists of extrinsic properties, or attributions of space, time, and function inferred from the first level through typology or classification. In a footnote to his discussion of the intrinsic and extrinsic levels, Gardin suggested that the dimension of human entities

could be included at the second level of the hierarchy. This dimension seems to be basically equivalent to ethnicity. In summary, Gardin's formulation is that properties or attributions of space, time, function, and ethnicity are all inferred from form.

It is my contention that a more explicitly rigorous examination of these so-called dimensions and their interrelationships would be useful in formulating a truly analytical methodology. As a first step, I think it is necessary to clear up exactly what is meant by the term dimension. Spaulding's definition is taken from the physical sciences and may well reflect what goes on in the physical world in a Euclidean sense. I suggest, however, that for archaeological analysis a different conception of dimensions is required. This suggestion is based on the inferential nature of explanation in archaeology. We attempt to explain variation and similarity in sets of artifacts in terms of various dimensions; that is, by inferring that the similarities or differences have spatial significance, temporal significance, etc. Gardin argued that all dimensions, except for form, are inferred from variation in form. He suggests only one level of inference (from form to all the others), whereas I argue that the other dimensions should be placed in a hierarchy according to their level of inference. I would define a dimension as a level in a hierarchy of inference.

As a second step, it is necessary to define the nature of each aspect of archaeological inference that resides at the various levels in a hierarchy of dimensions. Once again, we can look to the past practices and suggestions of archaeologists in order to isolate these aspects of inference. Spaulding argued that the basic dimensions or aspects of inference are form, space, and time. Gardin argued that space and time are inferred from form, observing that form is the

empirical basis for inference. As previously noted, other archaeologists such as Whallon and Read propose a set of dimensions within which archaeological inference is conducted. These include space and time, but also functional, social, and symbolic aspects. In Chapter 2.0 we observed that research in Iroquoian archaeology has been directed toward elucidation and control of a number of factors, or levels of meaning that also include these same dimensions. Although these researchers do not explicitly attempt to establish a methodological relationship among these factors, aspects, or contexts of inference, such an attempt has been made. In 1954, Christopher Hawkes published an article entitled "Archaeological Theory and Method: Some Suggestions from the Old World", in which he arranged aspects of inference in a hierarchy according to levels of difficulty. Hawkes made a distinction between the historical framework of archaeological inference and its cultural content (Hawkes 1954, 160). He emphasized the crucial necessity of controlling the historical framework, and then outlined the following levels of difficulty for inferring cultural content:

> 1. To infer from the archaeological phenomena to the techniques producing them I take to be relatively easy. ...
> 2. To infer to the subsistence-economics of the human groups concerned is fairly easy. ...
> 3. To infer to the social/political institutions of the groups, however, is considerably harder. ...
> 4. To infer to the religious institutions and spiritual life may seem superficially, perhaps, to be easier ... In general, I believe, unaided inference from material remains to spiritual life is the hardest inference of all. ...
> If material techniques are easy to infer to, subsistence-economics fairly easy, communal organization harder, and spiritual life hardest of all, you have there a climax of four degrees of difficulty in reasoning (Hawkes 1954, 162; emphasis in original).

Here we have a hierarchy of levels of inference, including technical, economic, social, and symbolic aspects, based on degree of

methodological difficulty, and, according to Hawkes, diminishing returns (1954, 163). Hawkes saw these levels as being increasingly difficult because they proceed from the more generically animal to the more specifically human (1954, 162). In other words, these levels proceed from etic to increasingly emic.

Hawkes' scale of difficulty has been the subject of some derision (e.g. Binford 1972, 93-94). As Trigger noted recently, however:

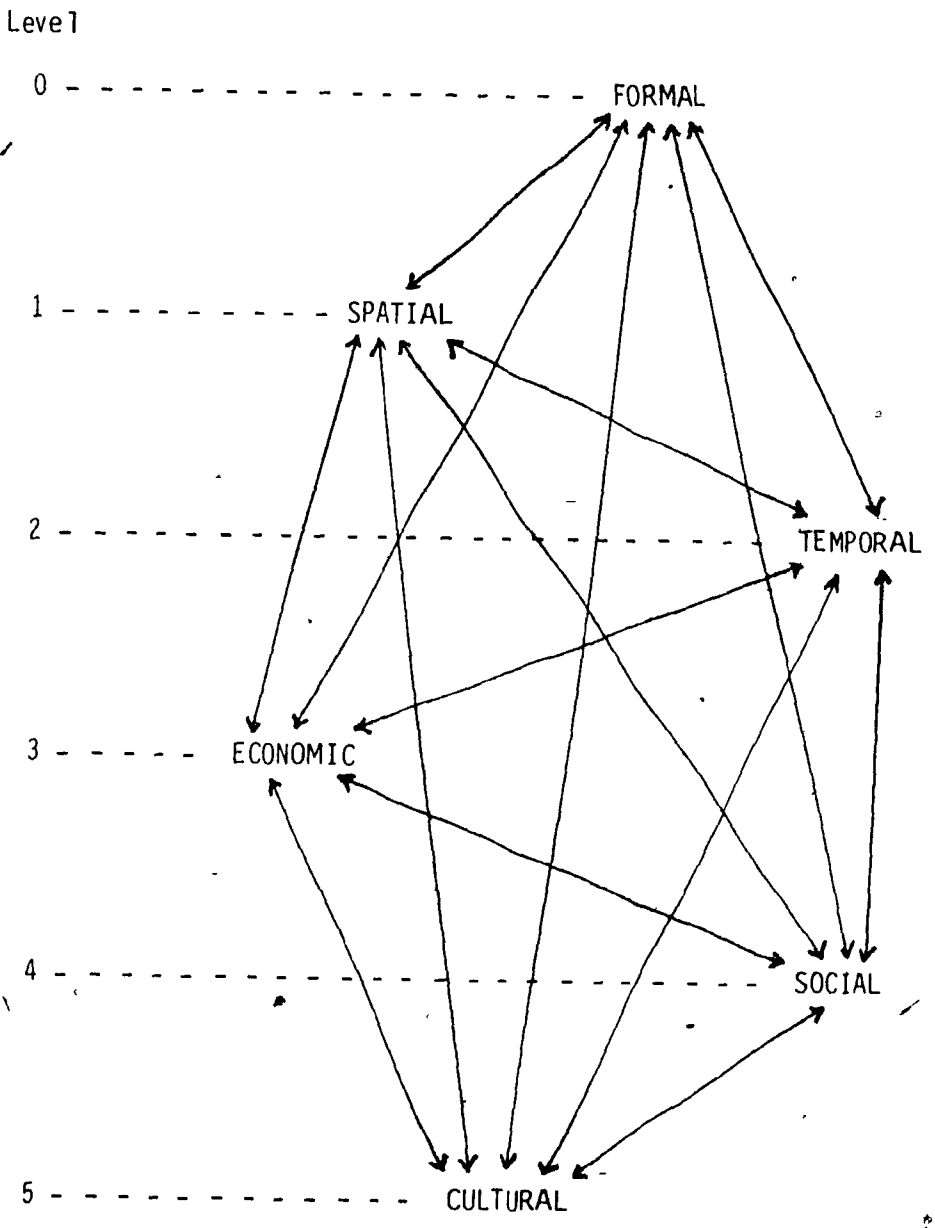
> The observation that there is more free variation in social organization and beliefs than in economic patterns provides a powerful theoretical basis for Hawkes' argument that prehistoric technology, economic behavior, social organization, and religious beliefs constitute a hierarchy of levels that archaeologists find increasingly difficult to infer (Trigger 1984, 282).

In fact, greater attention has been paid to degrees of difficulty of archaeological inference from a theoretical point of view in recent research (see Binford 1983b; Haas 1982). I argue that a closer examination of a hierarchy of levels of inference from a more clearly methodological point of view would also be highly worthwhile.

3.3 Levels of Inference

I propose that there are at least six dimensions of inference in artifact analysis: formal, spatial, temporal, economic, social, and symbolic. Further, I argue that these dimensions can be arranged in a hierarchy. This view is illustrated in Figure 2. The hierarchy is based on increasing complexity of inference and can be compared to Hawkes' levels of difficulty. The arrows in Figure 2 indicate the interrelatedness of each level or dimension with all of the others. The length of each arrow may be taken as a rough indicator of the difficulty of inferring from one level to another. We can now consider these levels of inference more analytically.

Figure 2: Archaeological Levels of Inference



Inference, in this context, refers to the process of attaching meaning to analytical entities within the context of a spatial-temporal framework and in terms of human behaviour. It is the act of linking the static archaeological record with the human dynamics that produced it, in Binford's terms. The actual process can be outlined syllogistically in terms of three steps, as follows:

Given: pattern in the static, contemporary archaeological record organized through classification into analytical entities;

If: assumptions and/or conditions concerning the relationship of human behaviour with the observed pattern;

Then: inferential statements about human behaviour.

Although all three steps are necessary and important, it is the second step concerning assumptions and conditions that is crucial. As the assumptions and conditions change, then so will the final inferential statement, and the strength of the final statement depends directly on the strength of the assumptions and conditions.

My argument is that the relative strength of the assumptions and conditions, and, therefore, of the resulting statements, can best be examined in terms of a hierarchy of levels of inference. In fact, I argue that any archaeological inference should proceed through the hierarchy by testing the assumptions and conditions starting at the lowest level and ascending as far as necessary. Worded differently, we can attempt to explain the pattern observed in the level of form through recourse to progressively more complex levels of inference. Well controlled inferences generated at lower levels of the hierarchy serve as assumptions for inference at higher levels of inference. Because of this, it is of overwhelming importance that assumptions and conclusions

at lower levels be tested in such a manner that a high degree of confidence and probability can be attached to them before proceeding to higher levels. In other words, if inference at low levels of the hierarchy is not very well controlled, then it is impossible to attempt inference at higher levels. For example, in this dissertation a model is proposed that attempts to link a stylistic anomaly to symbolic expression of economic tension between two contemporary, socially autonomous Iroquoian communities. It is, of course, necessary that both the spatial and temporal relations between or among sites be well established before any attempt is made to infer economic relationships, and vital that these economic relationships be carefully inferred before anything can be said about social or cultural aspects of the Iroquoian groups. The methodological assumptions for the organization of the hierarchy of inference are:

(1) if a formal pattern can be adequately related to human behaviour at a low level of inference, then there is no need to proceed higher up the scale;

(2) if a formal pattern cannot be adequately related at a lower level, and the assumptions and conclusions at this level are well controlled, then it is not only possible but necessary to proceed to the next highest level; and

(3) inference at any level must take into account, and, indeed, be tested in terms of, assumptions and conditions in all lower levels, including form.

In this way, the inferential process affects the nature of the classification that is conducted at the level of form. Archaeological classification must be, in effect, both flexible and sensitive enough to be directed toward inference at the various levels in an ongoing

procedure. Classification is, therefore, an integral part of the inferential process. These arguments hopefully will be rendered clearer by discussing the hierarchy of levels of inference using pertinent examples drawn from this chapter and Chapter 2.0.

Following Gardin, form is placed at the lowest level. It constitutes the empirical foundation of artifacts, and their traits and provenience, upon which the other levels of archaeological inference are based. As argued above, and illustrated in Figure 1, the empirical base can be viewed as embracing two distinguishable levels, these being physical and analytical. The physical entities of archaeology are artifacts for which attributes of traits and provenience are observed. These attributes are organized into analytical entities through classification. Both of these levels are empirical because they are established through observation. Although form is called empirical, there are a number of methodological assumptions associated with it. The level of form may be equated with 'any physical or material manifestation that is inferred to be evidence of human behaviour'. It is immediately apparent that the inferential nature of archaeology begins at this level, for it is assumed that archaeologists usually have the methodological and technical means to infer that a particular manifestation is, indeed, an artifact, and not the result of an agency other than human (see Grayson 1986). According to Binford, this level of inference is neither simple nor direct, because the archaeological record is static and contemporary, whereas the human behaviour that produced it was dynamic and unobservable since it occurred in the past.

Several of the debates mentioned above in Chapter 2.0 and this chapter have centred on assumptions having to do at least partly with the level of form and the nature of analytical entities. In Chapter

2.0, for example, we examined the development of assumptions concerning the role of artifacts, types, and attributes as analytical entities, with the arguments becoming more explicit as we progressed through time. Much of this debate, however, can be reduced to arguments relating to whether physical and analytical entities are real and discovered, or whether they are imposed by the archaeologist. This distinction determined much of the approach to cultural classification that was used as a rudimentary form of explanation. The Midwestern Taxonomic System, for example, assumed that cultural content could be ascribed to pattern of variation recognized at the level of form. The tradition-horizon approach, in addition to ascribing cultural content, also ascribed both spatial and temporal significance to pattern in the archaeological record. Both of these approaches to cultural classification assumed that patterning is real and discovered without documenting or testing this assumption. This debate may be put into context, although not resolved, if it is realized that the significance of pattern, whether this significance is considered to be spatial, temporal, economic, social or symbolic, cannot be recognized or ascribed by archaeologists, but must be inferred. It would appear, in fact, that some archaeologists have denied the inferential nature of the various factors, levels of meaning, or, as I call them, levels of inference, including form. The significance of patterns of variation recognized at the level of form are best discussed in terms of higher levels of inference.

There are, however, assumptions specific to the level of form that are related to inference concerning both physical and analytical entities of archaeology. Assumptions concerning physical entities are related directly to the inference that physical or material manifestations are evidence of human behaviour. One explicit examination of

such assumptions can be seen in the work of Michael Schiffer (1976). He argued that the archaeological record is distorted by N-transforms produced by natural agencies such as root action, and C-transforms produced by human agencies such as reoccupation of a site. Both N-transforms and C-transforms, he argued, must be controlled before further inference can be conducted. Using our operational definition of inference, the following process can be constructed:

Given: physical or material manifestations;

If: assumptions and conditions based on our understanding of N-transforms and C-transforms;

Then: the manifestations are, or are not, artifacts (evidence of human behaviour).

Assumptions concerning analytical entities have centred around which entity is most basic to archaeological analysis of artifacts. For Boyle and Wintemberg, the artifact itself was the most basic entity, although Wintemberg began using attributes. For MacNeish and Emerson, the type was the most basic analytical entity. Recently, it has been argued by Wright and others that the attribute state is the most basic entity, and the attribute state is the most accepted entity in contemporary Iroquoian archaeology. Assumptions on how to treat such entities methodologically have been, and still are, subject to intense debate (e.g. Whallon and Brown 1982).

It is my contention that artifact analysis must take into account both the distinction between physical and analytical entities, and the distinction between methodological and theoretical assumptions. As an illustration of this, we can look to a recent article by Spaulding (1982). He argued that, in the analytical process, artifactual attributes should be treated in the form of nominal variables, even if

they were originally measured using interval or ordinal scales. His bases for this argument are twofold. The first is a methodological assumption that nominal variables are best suited for purposes of archaeological classification. The second is a theoretical assumption that human beings generally, in an emic sense, think in terms of nominal variables. Viewed from this perspective, the methodological assumption, on the one hand, is more fundamental. It is an argument that inference should be conducted on the basis of analytical entities that are distinct from physical entities. The theoretical assumption, on the other hand, is an archaeological hypothesis that requires evaluation and documentation at levels of inference beyond form.

The link between the observed traits and provenience of artifacts and the higher levels is provided by archaeological classification. As far as the spatial and temporal dimensions are concerned, it has been implicitly assumed by other researchers that, all other aspects being equal, variation of form in space and time is regular. Deetz and Dethlefsen (1965) have argued that when dealing with diffusion a mathematical formula can be applied to adjust for spatial variation when seriation of spatially separate components is attempted. For such a formula to work with any degree of accuracy, variation in space must be relatively smooth. Rouse has defined seriation as a procedure that generates a relative chronology of components by placing them in the order "... which produces the most consistent patterning of their cultural traits" (Rouse 1967, 157). For such consistent patterning to occur through time, and therefore, for seriation to be accurate, variation in time as well as space must either be relatively smooth or take the form of clearly bounded, internally homogeneous units.

The primitive assumption concerning variation of form in time and

space, then, is that, other factors being equal, this variation will be regular or clinal. When anomalies in this regularity are detected, they must be explained in terms of other factors. In our hierarchy of levels of inference these other factors must be economic, social and/or cultural. The first analytical step, therefore, is to examine the nature of variation of form in time and space in order to discover anomalies that may yield information in terms of the higher levels.

When considering variation at the higher levels of inference it is useful to think in terms of sectors of the artifact system. The archaeological necessity of distinguishing between patterns of variation that can be inferred at the economic, social, and cultural levels has been recognized by Binford:

> ... we must be able to distinguish those relevant artifactual elements within the total artifact assemblage which have the primary functional context in the social, technological, and ideological subsystems of the total cultural system (Binford 1962, 220).

In line with this distinction, Binford proposes three sectors into which differing artifactual forms would fall: technomic, socio-technic, and ideo-technic. Inference at the higher level of inference involves the assumption that the pattern of variation identified for each of the sectors listed above will reflect the pattern of the human behaviour that produced the artifacts. For example, at the economic level of inference, we are, according to Binford, concerned with identifying technomic artifacts:

> Technomic signifies those artifacts having their primary functional context in coping directly with the physical environment. Variability in the technomic components of archaeological assemblages is seen as primarily explicable in the ecological frame of reference. ... We can directly correlate technomic items with environmental variables since we can know the distribution of fossil flora and fauna

> from independent data - giving us the nature of extinct environments (Binford 1962, 220).

In other words, it is assumed that patterns of variation inferred as having their meaning defined at the economic level must be identifiable in terms of relationships with technology, the physical environment, and ecological adaptation. According to the precepts listed above for the framework of levels of inference, however, if pattern of variation cannot be related to economic factors, then we must proceed to a higher level. On the other hand, this step can only be attempted if the assumptions employed at this level, and all lower levels of inference, are well controlled. For instance, if differences in pipe forms cannot be explained in technological or economically adaptive terms, and our understanding of these aspects, as well as spatial and temporal variation, is well established, then we can be confident that the meaning of the anomaly lies within the social or cultural realms.

The same kinds of assumptions hold at the social and cultural levels of inference. It is assumed that pattern of variation inferred to have meaning at the social level will be related to the social relationships that prevailed within or between groups of people. For example, as noted in Chapter 2.0, Whallon (1968) assumed that homogeneity in the archaeological record can be inferred to reflect degree of social homogeneity, cohesion, or integration. Finally, it is assumed that pattern of variation inferred to be meaningful at the cultural level will reflect in some way the ideological and symbolic systems of a particular group or groups of people. For example, Wobst (1977) and Hodder (1979) have relied on this assumption to make inferences at this level concerning such things as symbolic reflections of ethnicity.

At this point, we can consider a methodological approach to the generation and testing of an explanatory model useful for the analysis of archaeological artifact assemblages undertaken in this dissertation. Following from the above discussion of a framework of levels of inference, it can be argued that archaeologists generally do not attempt to explain regular or clinal patterns of variation. Rather, they are concerned with departures from such a pattern, or anomalies, whether the departures are of increased difference or increased similarity in comparison to expected pattern. Such anomalies are linked to patterns of human behaviour in the form of hypothetical statements that are testable in some manner.

Merrilee Salmon (1982) has recently discussed the means of testing hypotheses in some detail. One approach to testing that has been explicitly attempted in recent years is the Hypothetico-Deductive (H-D) method. It seeks to explain anomalies deductively by appealing to general law-like statements concerning human behaviour. As Salmon points out, however, most archaeological hypotheses are formulated as statistical generalizations, for which the H-D approach is not appropriate (Salmon 1982, 39-42). She states:

> Although the importance of statistical sampling methods and testing is becoming widely recognized among archaeologists (Thomas 1976; Binford 1977), not explicitly recognized is that these methods do not fit under the rubric of the H-D method of confirmation. As a result, the inadequacy of the H-D method for archaeology tends to be overlooked, and some archaeologists have stated positions in their theoretical works that are not reflected in, or are incompatible with, their substantive work... (Salmon 1982, 40).
>
> Although the explicit formulation of hypotheses as well as the testing of these hypotheses by observation and experiment are important to scientific archaeology, emphasis on "deductive methods" is misplaced (Salmon 1982, 56).

An alternative approach, and one that Salmon argues is not only more suitable to archaeological attempts at explanation, but is, in fact, often employed by archaeologists involves both inductive and deductive reasoning and the testing of alternative hypotheses:

> Deductive reasoning is important in archaeology, as it must be in any science that employs statistics. Nevertheless, in spite of the support given by mathematics and deductive reasoning, the problem of confirming statements about the past on the basis of contemporary archaeological evidence is basically a problem in inductive logic (Salmon 1982, 33; emphasis in original).

In other words, Salmon argues that both inductive and deductive reasoning can be useful for generating or constructing explanatory models, but that inductive reasoning is appropriate for testing them.

Salmon discusses three key factors that emphasize the differences between inductive and deductive arguments:

> 1. The validity of deductive arguments is a formal matter depending only on the structure, that is, the relations between the terms or statements. ... Inductive arguments are somewhat dependent on structure for their correctness, but content and background information are also important.
> 2. Inductive arguments, unlike deductive arguments, are "ampliative" ... This means that the conclusion of an inductive argument contains more information than its premises. ...
> 3. ... because "new" information can occur in the conclusion of an inductive argument, it may be false even though the premises are true and do lend support to the conclusion (Salmon 1982, 33; emphasis in original).

The third factor poses the important problem of how to test an inductive argument. Since recourse cannot be made only to the form or structure of the argument, as the the case with the H-D approach, evaluation of the content of the argument becomes crucial. Evaluation of the content of an inductive argument, according to Salmon, should be framed in terms of examination of context and relevance. She offers three guidelines

for such an evaluation:

(1) The impact of disconfirming evidence:

> An hypothesis cannot be considered confirmed in the absolute sense if there is significant disconfirming evidence, regardless of how strong the confirming instances (Salmon 1982, 37).

(2) The importance of sampling variety:

> In the absence of disconfirming evidence, the more relevant variety in confirming circumstances, the more strongly confirmed is the hypothesis. ... In order to achieve relevant variety in observable predictions, one must consider the domain of applicability of an hypothesis. ... After the domain of applicability is identified, it should be divided into partitions such that it would be plausible to suppose that the hypothesis would be more likely to hold in one partition than in another. ... [Then] tests in the form of experiments or observations are devised for seeing whether the hypothesis holds in various partitions (Salmon 1982, 37-38).

There are two important aspects of this guideline that may be stressed. Firstly, Salmon points out that archaeologists should be, and are, concerned with formulating and testing alternative hypotheses instead of focusing on one. The H-D approach does not allow for such a procedure (Salmon 1982, 41). Secondly, it is necessary to follow a systematic means of establishing the relevance of hypotheses for the problem at hand, and of establishing the significance of hypotheses in terms of this relevance. This leads to the final guideline:

(3) The issue of significance in the value of evidence:

> In the absence of disconfirming evidence, the more significant the confirming instances, the more strongly confirmed is the hypothesis. ... Significance is a matter of substance, not form, and a knowledge of the subject matter is required to separate the significant from the insignificant (Salmon 1982, 39).

Significance judged in terms of the substance or content of an argument is, therefore, dependent on the context of the confirming instances.

I argue that the framework of levels of inference presented in this section provides a systematic means for both generating and testing an explanatory model following the guidelines suggested by Salmon. Generating an argument using this framework involves both inductive and deductive reasoning. It is deductive at a very basic level because it relies on a number of primitive assumptions that provide a foundation for inference. Building on this foundation, an explanatory model is formulated by generating a number of inferences at each consecutive level, with inferences that are firmly established at lower levels serving as a basis for inference at higher levels. The latter is an inductive procedure. Constructing a model in this way establishes domains of applicability at each level of inference and provides a systematic context for the positing of relevant and testable hypotheses. It also allows what Salmon calls prior probabilities to be established:

> The prior probability of an hypothesis is simply the degree of plausibility it has prior to the testing situation being considered (Salmon 1982, 42).

In our case, the prior probability of an hypothesis that is formulated as an inference based on strong assumptions generated at a lower level can be said to be higher than one that is not. Prior probabilities aid in the selection of hypotheses that are relevant within a particular domain of applicability or level of inference. Such hypotheses can then be evaluated by comparing, or mapping, the predictions of the expected pattern they imply with patterns of variation identified in the data base. The practical application of this methodological procedure is discussed in the following concluding section.

3.4 Summary and Discussion

In this chapter we have considered the objectives of archaeological

artifact analysis, the nature of archaeological explanation, and methods of confirming explanatory models. The objectives discussed above can be restated in terms particular to artifact analysis. Bruce Trigger (n.d.) has suggested that Binford's middle range research can be set into a context of levels of research as follows:

Low Range Research - links artifacts with other artifacts

Middle Range Research - links artifacts with human behaviour

High Range Research - links human behaviour with human behaviour

These can be said to constitute both the objectives of artifact analysis and the elements of a methodological approach for producing explanatory models. In order to operationalize these objectives, I have suggested that a hierarchy of levels be employed to guide inference in the production of models and provide a framework for testing them.

It remains to frame the research problem of this dissertation, and the approach to its investigation, in terms of the above discussion. The first stage was the construction of an explanatory model in terms of levels of inference that would account for the physical entities under examination in the study and use of the levels to control an analogical application through a form of the Direct Historical Approach. This model was so constructed that the inferences and assumptions at each level could be examined explicitly. The second stage was to test the model by formulating predictive hypotheses about pattern of variation that could be compared to alternate hypotheses in terms of how well the expected pattern mapped onto the observed pattern elicited through manipulation of the analytical entities.

The research problem can be reformulated as follows. At the level of form an apparent spatial anomaly in ceramic styles was intuitively

identified. It was necessary to develop a model that would explain this anomaly in terms of patterns of human behaviour and, ultimately, to explain the pattern of behaviour thus inferred in terms of general behavioural patterns. Such a model is described in Chapter 4.0. It relies on the relationships between the physical entities (artifacts, sites, and physical environment) and behavioural patterns inferred through use of ethnographic analogy.

The testing of the model is described in Chapter 5.0. The evaluation was conducted by mapping the assumptions of pattern of variation at each level of inference onto the patterns of variation revealed through an examination of the analytical entities. The first step was to establish if the assumption of a spatial anomaly could be justified in terms of the analytical entities. In other words, the characteristics of artifacts were related to those of other artifacts at the level of form to ascertain whether or not the anomaly could actually be said to exist analytically. The second step was to relate patterns of variation, especially the inferred anomalous pattern, to patterns of human activity. This was done by proposing and testing hypotheses attempting to account for the anomaly at the successive levels of inference until the patterns ceased to be anomalous; that is, until an hypothesized pattern of human behaviour mapped onto the pattern of variation in the data base.

CHAPTER 4.0

Data Base and Explanatory Model

4.1 Introduction

This chapter is devoted to a discussion of the empirical aspects of my research and some of the pertinent archaeological assumptions surrounding them. These aspects consist of the relevant physical features of the research area, the characteristics of the sites from which the artifacts employed in this study were recovered, and the nature of the artifact assemblages. Included is an overview of past archaeological investigation in the area, an examination of sampling problems, and a discussion of environmental factors in the research area. The ultimate objective of this chapter is to lay the groundwork for, and to propose in detail, the substantive problem and explanatory model of this dissertation. It must be emphasized that in his chapter the model is simply proposed, not tested. The evaluation of the model is conducted in the following chapter.

The problem of this study is to explain what appears to be a formal anomaly in pipe styles between two groups of sites in the study area in terms of higher levels of inference. Briefly stated, the explanatory model developed here proposes that the stylistic anomaly is a symbolic manifestation of economic tensions between two contemporaneous, but economically and socially autonomous, Iroquoian communities occupying village sites within a relatively small area. This model is developed on the basis of a number of assumptions relating to the levels of inference discussed in the previous chapter. At the level of space, an argument is developed that there is, in the study area, a pattern of locations of Iroquoian sites that can be matched with the formal anomaly

of pipe styles. Temporally, it is argued from a preliminary standpoint that certain of these sites are contemporaneous by seriating the pottery assemblages using MacNeish's types as seriation entities. To establish preliminary chronometric relationships among the sites, Wright's Ontario Iroquois Tradition is employed as a general framework because it is the only such framework that is presently in wide use. The spatial and temporal evidence is used to suggest that there were at least two Iroquoian communities living in the study area during the time under consideration. At the level of economy, the primary assumptions of the model are that the Iroquoian communities in the research area were economically autonomous and self-sufficient, but that there was some form of economic competition between or among them. Since economy is viewed here as human interrelationships having to do with dealing with the physical environment, an examination of the natural context of the study area is undertaken. The focus of this investigation is to argue that the natural environment in the research area is quite varied, and that this variability contributed to economic tension. At the social level, the primary assumptions are threefold: there were only two communities living in the research area; these communities were politically independent and autonomous; and, although the two communities were autonomous, there would have been social interaction of some form between them. All of these assumptions, as well as the economic ones, are argued on the basis of comparison of similarity and difference in both pottery and pipe styles (using MacNeish's and Emerson's types), and through the examination of a historically documented group, the Huron, as an ethnographic analogue. The focus of the latter is on the nature of an Iroquoian community as an economically self-sufficient and politically autonomous unit, and the social relations among such communities.

Finally, at the cultural level, it is assumed that tensions between the two communities were manifested symbolically as stylistic differences in a visible medium, smoking pipes. This suggestion is made in light of interpretations concerning use of smoking pipes that can be derived from examination of the historic analogue.

The research area within which are located the Iroquoian sites that provided the basis for this study is situated in southcentral Ontario near the Town of Milton, about 65 km. west of Toronto and approximately 30 km. northwest of the western end of Lake Ontario (see Figure 3). When discussing geographical space in this chapter, I will adopt the following terminology. The part of southcentral Ontario near the western end of Lake Ontario will be referred to as the general region. The roughly 600 square km. depicted in Figure 4 that contains the sites examined in this dissertation will be the research area. The limited part of the research area located within a roughly four km. radius of Crawford Lake will be referred to as the Crawford Lake locale.

4.2 The Natural Environment of the Research Area

In this section I will deal with the physiography, climate, and natural communities (flora and fauna) of the research area. The objective is to identify and discuss some salient factors that may have been important for the prehistoric social organization that developed in this area. The relationship between the natural and social environments will be discussed in later sections of this chapter.

Because the multidisciplinary study of the Crawford Lake locale has, to date, emphasized the archaeological approach, not a great deal of data pertaining to past natural environment has been gathered. Because of this, I am not able to propose patterns concerning the past

Figure 3. Southern Ontario Showing Location of Research Area and Middleport Sites Outside the Research Area

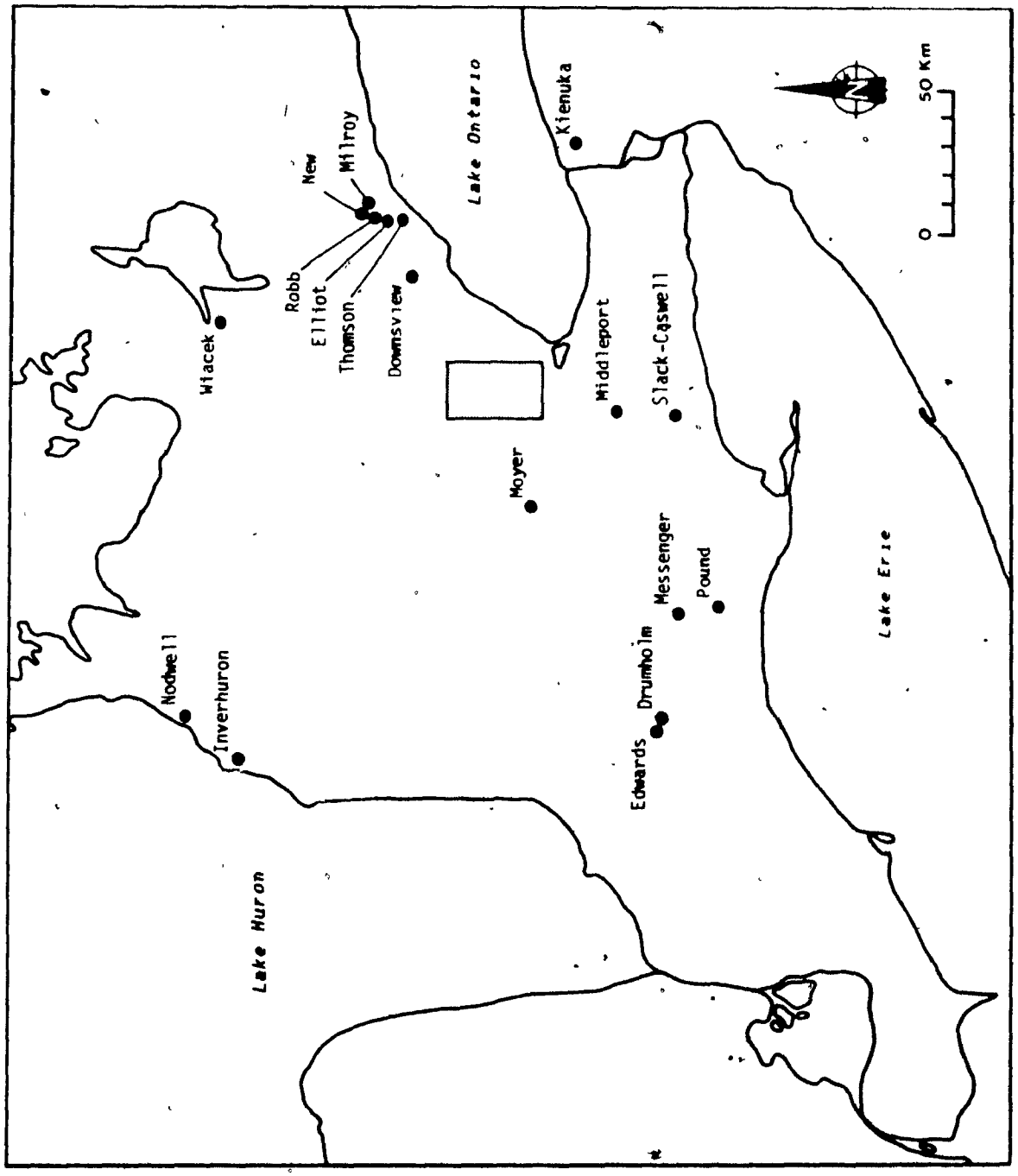
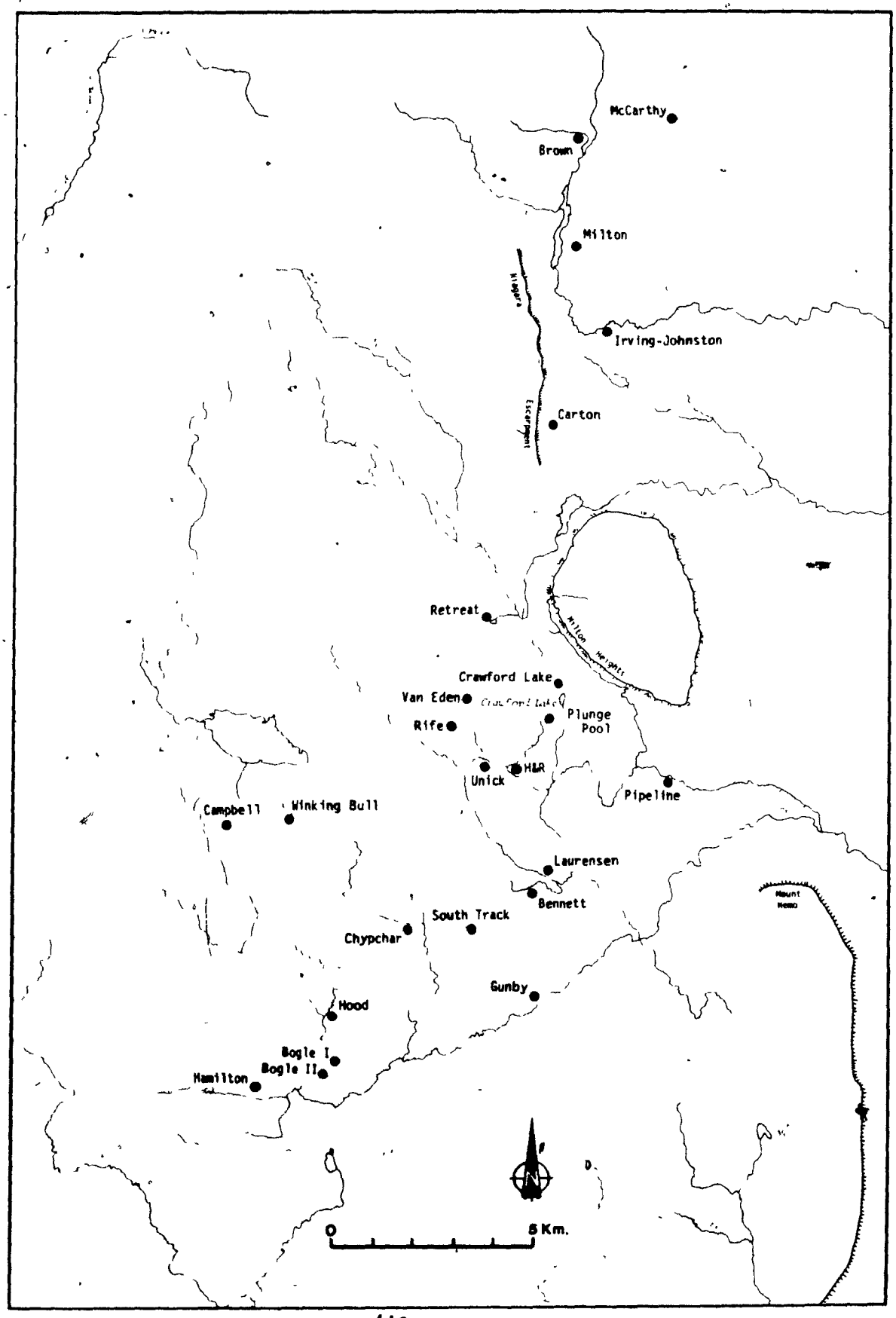


Figure 4. The Research Area Showing Iroquoian Sites, the Niagara Escarpment, and Major Drainage Patterns



natural environment using a direct line of inference. Instead, I will describe the environmental relationships that exist at present and infer, by extrapolation, the nature of the natural environment over the past 600 to 700 years. To do this, we must examine a number of assumptions concerning both local and regional factors that may have altered physiography, climate, and natural communities. In particular, the diversity in natural environment emphasized in the subsections below will be discussed in terms of the likelihood that it existed in the past.

The description and interpretation of the natural environment that follows is illustrated graphically by maps in Figures 4 to 8. These maps all display exactly the same area, except for Figure 4 which is extended a short distance to the south, and are all at the same scale for ease of comparison.

4.2.1 Topography and Physiography

The most important physical characteristic of the research area is the environment associated with the Niagara Escarpment, the predominant physiographic feature here. The Niagara Escarpment runs across southern Ontario from the Niagara River to the Manitoulin Island system. The nature and formation of this geological feature are described in detail elsewhere (e.g. Gosselin, Shaw and Papaioannou 1975; Chapman and Putnam 1984). The escarpment consists of a cap of erosion resistant dolomite underlain by softer rocks. The escarpment was formed as the softer rocks eroded and undercut the dolomite, leaving a steep scarp face that separates different levels of relatively flat land. The combination of the escarpment, glacial modification, and post-glacial erosion has produced a physiographic area that "... displays an association of land-

"forms not found elsewhere in Ontario" (Chapman and Putnam 1984, 114).

The research area of this dissertation lies in that section of the Niagara Escarpment between the Dundas Valley and the Forks of the Credit River. In this portion:

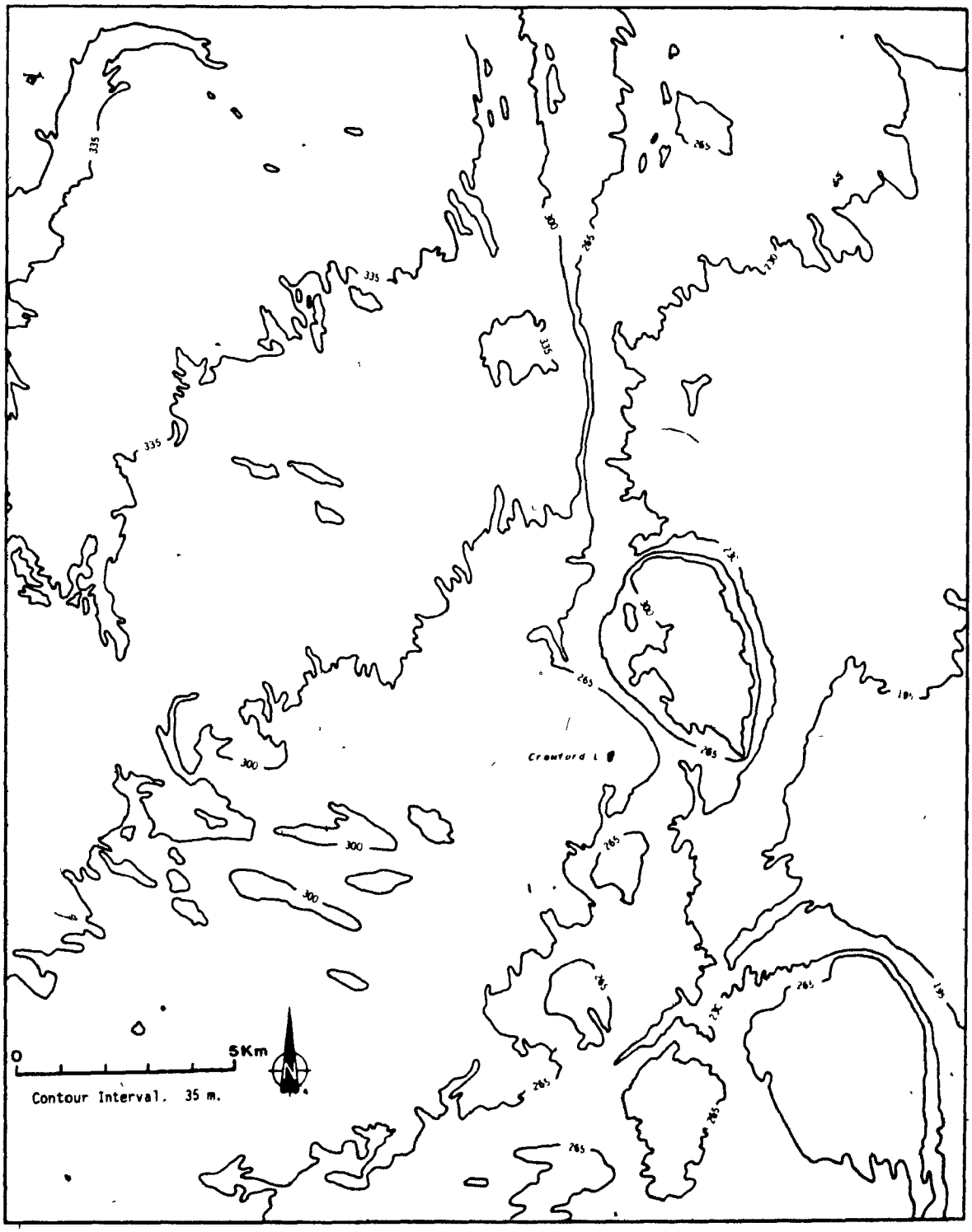
> ... the brow of the escarpment increases in elevation from 800 feet [250 m.] to 1450 feet [450 m.] above sea level in a distance of 50 miles [80 km.]. In this section, also, the escarpment is cut by numerous creeks. Several fairly large valleys are found near Waterdown, Lowville, Campbellville, and Limehouse (Chapman and Putnam 1984, 115).

The Iroquoian sites investigated in this thesis are generally situated in the area near the part of the escarpment cut by the valleys at Lowville and Campbellville formed by Sixteen Mile Creek and Bronte Creek respectively, and drained by these streams and their tributaries. In addition, a mesa-like outlier or detached section of the escarpment, known as Milton Heights, is also located in this area (see Figure 4).

The variation in landforms is quite evident in topography (see Figure 5). The escarpment divides two areas of relatively flat land that vary quite dramatically in elevation. In the region to the west, or 'above' the escarpment, elevations reach 340 metres (1125 ft.) above sea level and higher. To the east, or 'below' the escarpment, elevation is as much as 150 metres (500 ft.) lower. In addition, as noted above, the area is cut by a number of valleys formed by relatively recent stream erosion, and there are also areas of glacial outwash formed during the Pleistocene. Above the escarpment, there are fields of glacial drumlins that manifest themselves topographically as 'cigar-shaped' hills (see Figures 5 and 6).

The area surrounding the escarpment in the section described above is characterized by a number of physiographic zones. The major zones that have Iroquoian sites located within their boundaries are the

Figure 5. Topography of the Research Area



Flamborough Plain, the Peel Plain, and the South Slope. The Flamborough Plain is located above the escarpment, and, as such, rests on the dolomite bedrock that forms the cap of the escarpment. Chapman and Putnam classify this area as a limestone plain with poor drainage and thin soils, and have the following to say about present land use:

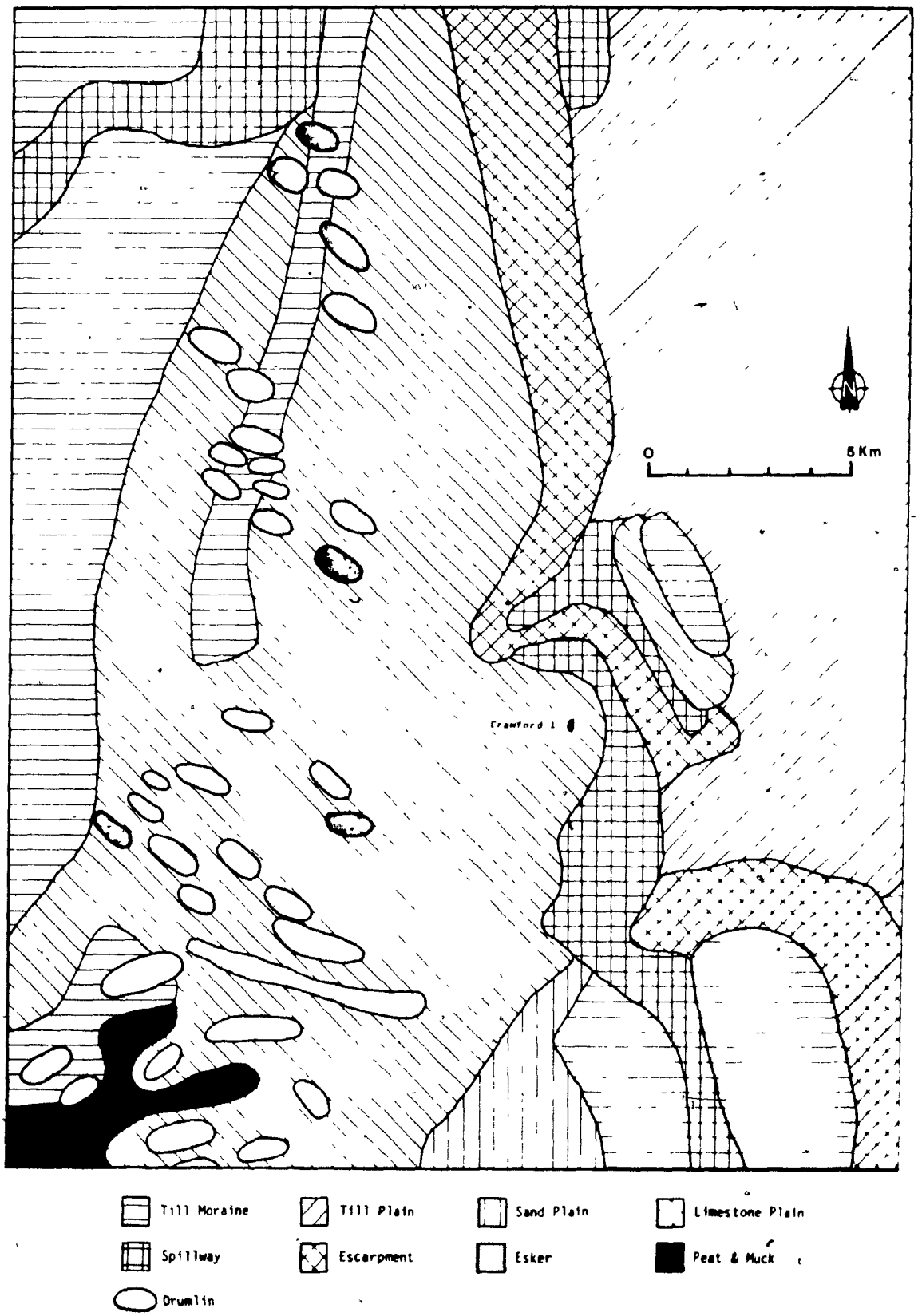
> Good soil is not plentiful in this little region: the soil is either wet or stony or shallow. Thus most of the area is still in woods or pasture. The cultivated soil is found mainly on the drumlins and deeper gravel terraces. The swamps serve as water reservoirs and produce cedar posts and other wood (Chapman and Putnam 1984, 130).

The Peel and South Slope are both located to the east of the scarp face 'below' the escarpment. Chapman and Putnam classify the Peel Plain and South Slope as a bevelled till plain and a drumlinized till plain respectively; being till plain their physiography was determined more by glaciation than the presence of the escarpment. In contrast to the Flamborough Plain, both of these zones good have soils, and in the area of the escarpment some of them are well drained. Their agricultural potential is good.

The diversity of physiography associated with the Niagara Escarpment in the research area is most pronounced in the Crawford Lake locale. The detailed distribution of physiographic areas is displayed in Figure 6. Within a three km. radius of the lake, four major physiographic types are encountered: escarpment, till moraine, spillway, and limestone plain. Crawford Lake itself is located on a 'tongue' of the Flamborough limestone plain that is surrounded on three sides by spillway and combinations of escarpment and till moraine.

Physiographic changes that may have occurred in the past can be related directly to erosion stemming from historic land use over the past 100 to 150 years, since other forms of erosion appear to be

Figure 6. Physiography of the Research Area



minimal. As noted by Chapman and Putnam, however, European style agricultural practices have not been very intensive in the research area because "The direct effect of the escarpment upon agriculture has been almost entirely negative" (1984, 119). The assumption, then is that the effects of erosion of this sort on the physiography of the research area have been minimal, allowing us to infer that this physiography has not been greatly altered over the past 500 to 600 years. By extension, environmental factors related to local diversity in physiography should not have been affected to any great extent.

4.2.2 Soils

Because of the Niagara Escarpment and glacial action upon it, the nature and distribution of soils in the Crawford Lake area are quite complex. The region overlaps two general soil texture-topography classes: (1) undulating to rolling clay loams and imperfectly drained clays below the escarpment; and (2) hilly and stony loams above the escarpment (Chapman and Putnam 1984). The soil associations in the research area are displayed in Figure 7; only the dominant families in each area are listed, although most areas contain other soil families. Table 1 summarizes the characteristics of the dominant soil families. The areas labelled 1, 2, 3, and 5 are located above the escarpment; that labelled 4 is located below. Most of these soils are classified in the Grey Brown Podzolic Great Soils Group, except for a band classed in the Brown Forest Great Soils Group that runs above the escarpment at its edge and includes the Crawford Lake locale. This is demonstrated by the distribution of Farmington Loam (5) in Figure 7. One characteristic of note from this table is that the soils above the escarpment are all well drained, while those below the escarpment are imperfectly drained for

Figure 7. Soil Associations of the Research Area

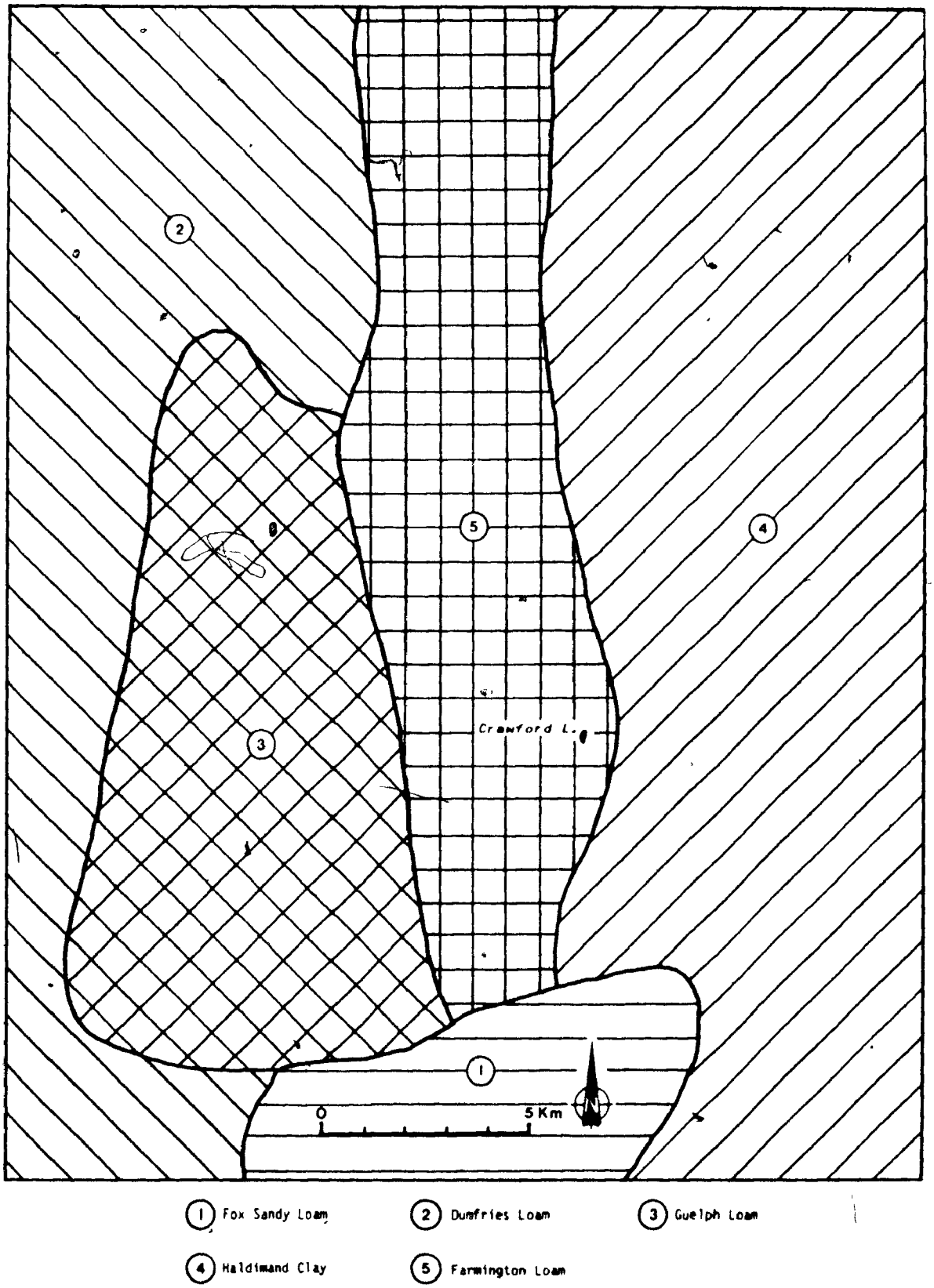


Table 1. Soil Associations of the Research Area

1. Dominantly coarse textured soils formed on sand and gravel

Dominant Family	Texture	Topography	Drainage	Surface Reaction	Stoniness
Fox	Sandy Loam	Undulating	Good	Slightly Acidic	Stonefree

2. Dominantly medium and coarse textured soils formed on coarse, stone till

Dominant Family	Texture	Topography	Drainage	Surface Reaction	Stoniness
Dumfries	Loam	Hilly	Good	Slightly Acidic	Exceedingly Stony

3. Dominantly medium textured soils formed on till

Dominant Family	Texture	Topography	Drainage	Surface Reaction	Stoniness
Guelph	Loam	Rolling	Good	Slightly Acidic	Few Stones

4. Dominantly very fine textured soils formed on till or lacustrine sediments

Dominant Family	Texture	Topography	Drainage	Surface Reaction	Stoniness
Haldimand	Clay	Undulating	Imperfect	Medium Acidic	Stonefree

5. Dominantly medium textured soils formed on till with bedrock at one foot or less

Dominant Family	Texture	Topography	Drainage	Surface Reaction	Stoniness
Farmington	Loam	Level	Variable	Neutral	Moderately Stony

the most part.

The detailed distributions of soil Groups and Great Groups in the research area are highly complex and difficult to display in graphic form. There is a great contrast between the proliferation of soil types above the escarpment and the much simpler distribution below the escarpment. The most important aspect of soils for the purposes of this study is their capability for agricultural production. The soils of the research area are grouped into seven capability classes from Class 0 to Class 6 according to the Canada Land Inventory (1972). The nature of each class is based on limitations related to a number of factors. The limitations that apply in the research area are described as follows:

Stoniness: Stones interfere with tillage, planting, and harvesting.

Soil Limitations: Limitations include one or of the following: undesirable structure, low permeability, a restricted rooting zone because of soil characteristics, low natural fertility, low moisture holding capacity, salinity.

Adverse Topography: Either steepness or the pattern of slopes limits agricultural use.

The capability classes that are found in the research area are described as follows:

Class 1: No significant limitations in use for crops. The soils are deep, are well to imperfectly drained, hold moisture well, and in the virgin state were well supplied with plant nutrients. They can be managed and cropped without difficulty. Under good management they are moderately high to high in productivity for a fairly wide range of crops.

Class 2: Moderate limitations that restrict the range of crops or require moderate conservation practices. The soils are deep and hold moisture well. The limitations are moderate and the soils can be managed and cropped with little difficulty. Under good management they are moderately high to high in productivity for a fair range of crops.

Class 3: Moderately severe limitations that restrict the range of crops or require special conservation practices. The

limitations are more severe than for Class 2 soils. They affect one or more of the following practices: timing and ease of tillage; planting and harvesting; choice of crops; and methods of conservation. Under good management they are fair to moderately high in productivity for a fair range of crops.

Class 4: Severe limitations that restrict the range of crops or require special conservation practices, or both. The limitations seriously affect one or more of the following practices: timing and ease of tillage; planting and harvesting; choice of crops; and methods of conservation. The soils are low to fair in productivity for a fair range of crops but may have high productivity for a specially adapted crop.

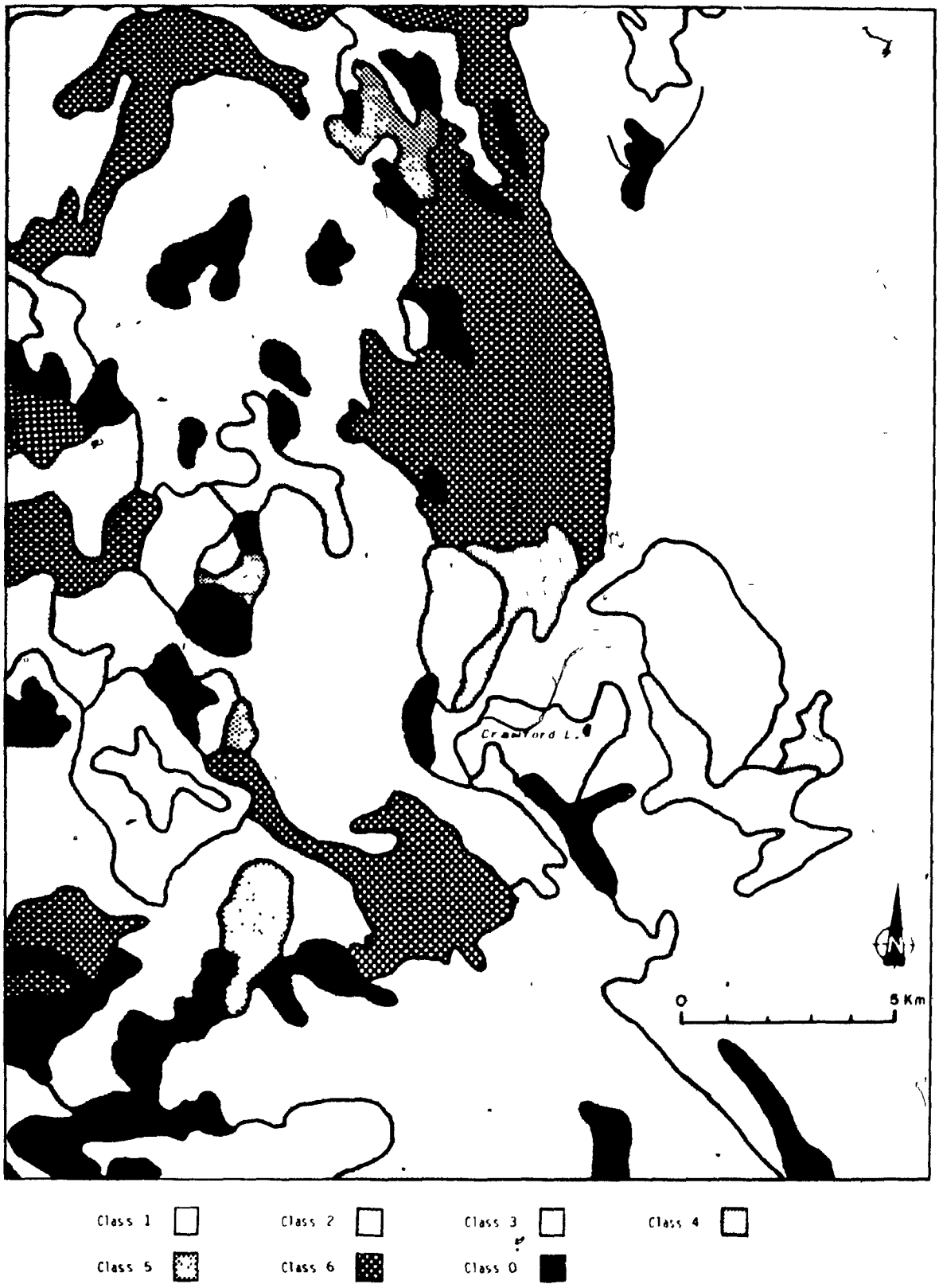
Class 5: Very severe limitations that restrict the capability to producing perennial forage crops, and improvement practices are feasible. The limitations are so severe that the soils are not capable of use for sustained production of annual field crops. The soils are capable of producing native or tame species of perennial forage plants, and may be improved by use of farm machinery. The improvement practices may include clearing of bush, cultivation, seeding, fertilizing, or water control.

Class 6: Soils in this class are capable only of producing perennial forage crops, and improvement practices are not feasible. The soils provide some sustained grazing for farm animals, but the limitations are so severe that improvement by use of farm machinery is impractical. The terrain may be unsuitable for use of farm machinery, or the soils may not respond to improvement, or the grazing season may be very short.

Class 0: Organic Soils (not placed in capability classes).

The distribution of these classes in the research area is displayed in Figure 8. The lightest areas of the map are those with the highest rating for capability for cultivation, while the darkest areas have the lowest rating. In this region, the Class 0 areas are all bottomlands, and have been coloured black in Figure 8. This map shows very clearly the variety of differing soil capabilities in this area and the contrast between the soils below the escarpment, which are predominantly Class 1 and 2 (high capacity), and those above the escarpment, which range greatly but are largely of lower capacity. The Crawford Lake locale

Figure 8. Soil Capability for Agriculture Classes in the Research Area (after Canada Land Inventory 1972)



includes pockets of all of the classes, including relatively large areas of higher capacity (Classes 1, 2, and 3) as well as bottomlands.

These classes are based on the contemporary agricultural capability of the land using modern techniques and machinery, which are different from the practices of cultivation employed by prehistoric Iroquoian communities. The major limitations of stoniness, soil problems, and adverse topography are, however, all factors that would have affected and limited the prehistoric Iroquoian agricultural use of the area. Since these are all factors that do not change quickly, it can be assumed that the same soil limitations that apply at present would have prevailed in the prehistoric past. Because of this we must assume that the contrast in soil capacity that exists between the areas above and below the escarpment existed over the past 500 to 600 years, with the soils below the escarpment being generally more favourable, and that the soil capability classes discussed here would have had more-or-less the same affects on native cultivation as they do on contemporary agricultural practices.

4.2.3 Climate

The climatic conditions in the research area are affected by the prevailing winds and weather systems that influence all of southern Ontario. In addition, this climate is affected by local factors such as the proximity of the area to Lake Ontario, and the physiography associated with the Niagara Escarpment. Below I will provide a summary of some pertinent climatic statistics for the area collected over the past 50 years (Brown et al. 1980).

The research area presently falls into the border area between the South Slope and Lake Ontario Shore climatic regions of southern Ontario

(Brown et al. 1980, 8). This border area situation combined with the topographic nature of the escarpment indicates the important effects that both general and local influences may have on producing major climatic variation within this geographic area. According to Brown et al., "The Niagara Escarpment deserves special attention because of its influence on the climate of the contiguous regions" (1980, 6). In other words, the following mean figures may vary substantially within the area; unfortunately, detailed studies of climatic variation associated with the escarpment do not appear to have been undertaken. Possible variations will, however, be discussed below.

Climatic statistics for the research area and surrounding regions are presented in Table 2. The statistics quoted in the text are those that appear to have the most direct effects on prehistoric land use: temperature, growing season, and precipitation. These figures are taken from Brown et al. (1980). The mean annual temperature for the general region of this study is 7 degrees C. (45 degrees F.). The mean daily temperature ranges from a low of minus 3 degrees C. (26 degrees F.) in January to a high of 21 degrees C. (70 degrees F.) in July. More important than simple mean temperatures is the seasonal variation that affects the growth of both wild and cultivated plant species and wild fauna. Brown et al. define a region's growing season as the period of time during which the mean daily temperature is above 6 degrees C. (42 degrees F.) (1980, 36). The mean annual growing season for our area is 205 days. Also important is the period of time during which frost is not a threat. The mean annual frost free period for the study area is 150 days. The mean annual precipitation is 87 cm. (34 inches).

The above figures indicate that, in the general region under consideration, the climate is quite adequate for the production of the

Table 2. Climatic Regions in and around the Research Area.

	Lake Erie Counties	Lake Ont. Shore	South Slopes	Huron Slopes
Altitude (m. above sea level)	215	92	215	335
Mean Annual Temp. (degrees Celsius)	8	7	7	7
Mean Daily Max. Temp. (degrees Celsius)				
- January	0	-2	-2	-2
- April	12	11	11	11
- July	27	26	27	26
- October	16	14	15	14
Mean Daily Min. Temp. (degrees Celsius)				
- January	-8	-11	-11	-10
- April	2	1	1	0
- July	15	15	14	13
- October	5	4	4	4
Daily Range of Temp. (degrees Celsius)				
- January	7	9	9	8
- July	12	11	13	12
Extreme Low Temp. (degrees Celsius)	-37	-34	-39	-42
Extreme High Temp. (degrees Celsius)	41	40	41	39
Mean Date of Last Frost in Spring	May 12	May 12	May 15	May 20
Mean Date of First Frost in Fall	Oct 10	Oct 8	Oct 5	Sep 30
Mean Annual Frost Free Period (Days)	150	150	145	135
Start of Growing Season	Apr 10	Apr 12	Apr 13	Apr 17
End of Growing Season	Nov 8	Nov 3	Nov 3	Oct 31
Mean Annual Length of Growing Season (days)	210	205	205	195
Mean Annual Growing Degree-Days	3700	3500	3500	3200
Mean Annual Precipitation (cm.)	86	86	76-97	81-99
Mean Annual Snowfall (cm.)	127	165	178	279
Mean Annual Potential Evapotranspiration (cm.)	64	61	61	58
Mean Annual Actual Evapotranspiration (cm.)	56	53	56	56
Mean Annual Moisture Deficiency (cm.)	8	8	5	3
Mean Annual Water Surplus (cm.)	33	33	30	41

three main Iroquoian cultigens (maize, beans, and squash). Modern capacity for growing maize is measured in 'corn heat units', an index that combines temperature with length of growing season. The climatic factors combine to produce a mean annual rate of 2900 corn heat units, the minimum number required to grow high yield, full maturity maize in present day Ontario (Brown et al. 1980, 38).

To compare the climate of the research area to surrounding regions we can use the statistics in Table 2. The Crawford Lake area falls into the boundary between the South Slopes and the Lake Ontario Shore. The figures in Table 2 indicate that, in effect, there are very few major differences between these two climatic zones. The statistics for these zones fall between most of the statistics for the Lake Erie Counties to the southwest, and those for the more northerly Huron slopes. In terms of capacity for agriculture, the research area is closer to the high capability of the Lake Erie Counties when number of frost free days, length of growing season, and number of growing degree days are examined. The research area in general can be considered to have a moderately high climatic capacity for cultivation.

There are a number of ways in which the physiography in the immediate area of the Niagara Escarpment can modify local climatic conditions. One of these is the effect that elevation has on temperature. Differing contiguous elevations can have marked differences in daily range of temperature. During daylight hours higher elevations, such as hill tops, tend to be colder than lower elevations, such as valleys. At night, however, the opposite is the case. "The colder air flows like water, moving down slopes into valleys and collecting in pools or 'frost pockets'" (Brown et al. 1980, 6). In areas where the topography varies locally as much as it does in the research area,

places of higher elevation will tend to have a longer annual frost free period, even though the growing season and number of corn heat units may not be affected to any great degree. This was confirmed in personal conversation with local farmers from the research area who claimed that the growing season in areas near the edge of the escarpment can be as much as two weeks longer than in areas of lower elevation.

In summary, then, we may argue that general climatic factors influenced by local physiographic differences in the research area, especially in topography, produce some variation in local climate, the most important of which is the difference in length of growing season between higher and lower elevations associated with the Niagara Escarpment. The effects of this climatic variation in conjunction with the physiographic diversity on the natural communities of flora and fauna in the area will be discussed in the next section.

The climatic conditions in the research area may have been influenced by temporal variation in regional climate. There have been a number of attempts to reconstruct the past climatic conditions of northeastern North America, and to relate variations in these conditions to social and cultural change (e.g. Griffin 1960; Baerreis and Bryson 1965; Cleland 1966; Baerreis, Bryson, and Kutzbach 1976; Fitting 1978; Styles 1981). It has been inferred by these researchers that climatic conditions varied, sometimes dramatically, over the past 1000 years, and a number of climatic episodes for this period of time have been defined. According to Bryson and Padoch (1981), the Post Sub-Atlantic episode, lasting from about A.D. 300 - 400 to the present, can be subdivided into the following sub-episodes:

Neo-Boreal	A.D. 1550 to A.D. 1915 - 1920
Pacific	A.D. 1150 - 1200 to A.D. 1550
Neo-Atlantic	A.D. 700 - 750 to A.D. 1150 - 1200
Scandic	A.D. 300 - 400 to A.D. 700 - 750

They point to evidence that indicates change in climatic factors that occurred after A.D. 1200 at the transition between the Neo-Atlantic and Pacific sub-episodes:

> That large-scale climatic changes were taking place in the northern hemisphere, at least, is essentially incontrovertible. The tundra of North America expanded southward rather quickly along a thousand mile front. The extent of sea ice around Greenland and Iceland expanded dramatically. Summer temperatures shown by pollen in annually layered lakes in northern Michigan dropped rapidly, and the dry "rain-shadow" area over the northern plains of the United States expanded eastward (Bryson and Padoch 1981, 15-16).

This suggests that the mean temperature in northeastern North America likely decreased after about A.D. 1200. These researchers point out, however, that climatic conditions may have varied from one region to another and should be documented for each particular area.

Unfortunately, detailed studies of past climatic conditions have not been conducted in the present study area, although some work has been done on reconstructing prehistoric plant cover based on data from the Crawford Lake varved sediment core (McAndrews and Boyko 1974). This work suggests that the forest cover was almost wholly deciduous (i.e. dominated by beech, maple, birch, and elm) until about A.D. 1350. There is evidence for some variation (i.e. decrease in some minor species such as hemlock) prior to A.D. 1350, but this variation has not been correlated with climatic changes. After A.D. 1350 there is evidence for an increase in both white pine (Pinus strobus) and grass, including maize in the area immediately surrounding Crawford Lake (McAndrews and

Boyko 1974). Two explanations have been proposed for this increase. On the one hand, the increase in white pine and grass may have been a result of the decline of deciduous forests associated with the onset of a period of cooler, moister climate (McAndrews and Boyko 1974). On the other hand, the change may be a local phenomenon attributable to the clearing of the deciduous climax forest for fields by Iroquoian horticulturalists occupying the Crawford Lake locale. After the fields were abandoned, they would have been colonized first by grass and then by white pine (McAndrews and Boyko 1974). This is not to say that the changes in flora could not have been coincidental with changing climate, but this has yet to corroborated. In other words, there is no clear-cut evidence for occurrence or non-occurrence of significant climatic change represented in the pollen from the Crawford Lake core.

To summarize, we may distinguish between spatial and temporal aspects of climatic variation that have been identified. The spatial aspects refer to the effects that the physiography associated with the Niagara Escarpment may have on local patterns of temperature and precipitation. The temporal aspects refer to changes in regional patterns of temperature and growing season that may have occurred in episodes over the past 1000 years. Unfortunately, neither of these, especially the temporal variation, is well documented at present. We may, however, formulate the following hypotheses relating the two to each other. If we allow for the possibility of significant spatial diversity in climate associated with the escarpment (Brown et al. 1980, 6), there is no evidence to suggest that such variation would have been eliminated during any of the postulated climatic episodes discussed above, regardless of chronology. In fact, the onset of cooler

temperatures after A.D. 1200 could have served to make the differences of growing season between higher and lower altitudes more important.

4.2.4 Flora and Fauna

In modern times, the research area of the present study falls into the northern section of the Carolinian biotic province, just south of the ecotone (transition zone) between the Carolinian and Canadian biotic provinces (Cleland 1966). The Carolinian province is characterized by primarily deciduous forest. The range of flora and fauna in this province is quite marked. Even more varied is the range of plants and animals associated with the ecotone. The natural communities in this transition zone tend to include flora and fauna that are associated with both of the larger provinces (Cleland 1966).

The floral and faunal resources of the research area, like the physiography and climate, are affected by the environment of the Niagara Escarpment. In fact, the variability in physiography and climate that characterizes this area clearly influences the diversity within the natural community. This diversity is most evident in the Crawford Lake locale. Fortunately, a study was conducted recently by Byrne (1974), the purpose of which was to examine woodland wild plant food potential. According to him:

> Largely because of the Niagara Escarpment the vegetation pattern is a complicated one, reflecting marked changes in aspect drainage, soil parent materials, and relief (Byrne 1974, 4).

Within a circular area with a three km. radius around the Crawford Lake site, Byrne defined five different habitat types: bottomland (4%), escarpment slopes (7%), limestone pavement (35%), outwash and kame (36%) and till moraine (18%). As is evident from the names, he related these types directly to the variability in physiography that occurs within

this locale. The diversity of habitat types produced a diversity of wild plant foods, with each habitat type being more important for certain foods than others. Byrne examined each habitat type for yield of tree products (nuts, sap, and bark) and herbs and shrubs (starchy roots, corms, rhizomes, vegetables, greens, fruits, and berries). The bottomland produced the largest range of herbs and shrubs, such as cattail (Typha sp), marsh marigold (Caltha palustris), wild strawberry (Fragaria virginiana), and red current (Ribes triste), but contained few tree products. The escarpment slope was important for shrubs such as elderberry (Sambucus sp) and was the only habitat type that yielded significant amounts of butternut (Juglans cinerea). The limestone pavement produced large quantities of oak (Quercus sp) and sugar maple (Acer saccharum), but was relatively poor in herbs and shrubs. The kame and outwash habitat yielded some sugar maple but was low in nut producing trees, herbs, and shrubs. On the other hand, this habitat type, which makes up the largest area (36%) of the area sampled by Byrne, has a high agricultural potential (Class 1 and 2 soil capability). Lastly, the till moraine has the highest agricultural potential in the area, according to Byrne, and also yielded sugar maple. Byrne summed up his study by stating:

> The 10 square mile area around the Crawford Lake site contains a diversity of vegetation types unusual for southern Ontario (1974, 4).
> The [area] contains a wide variety of possible wild food plants, only the more obvious of which have been considered here (1974, 18).

Very little detailed information concerning the faunal population of the research area is available. We can only assume that the large range of both large and small animals that occur in the Carolinian biotic province (Cleland 1966, 8) is available in this area. On the

theme of spatial variability, I will make some tentative suggestions about one important species only. This is the northern woodland white-tailed deer (Odocoileus virginianus borealis), the most common large herbivore to occupy the research area (Taylor 1956). The essential requirements for the survival of deer in a localized zone are the combination of an adequate supply of water and suitable foods, and appropriate cover (arrangement of forested and open areas) (Dasmann 1971, 13). In addition, these requirements, especially that of cover, vary from season to season. In summer, deer prefer the edges of habitat types where borders between forest and open areas occur. The most important limiting factor for deer populations is, however, winter relationship of food and cover (Dasmann 1971, 21). White-tailed deer require adequate cover to protect them from winter winds as well as a source of suitable winter food. As a result, deer tend to gather, or 'yard', for the fall and winter in stands of coniferous trees, especially white cedar (Thuja occidentalis), which is their preferred winter food (Taylor 1956, 139-140). In the research area, the most suitable combinations of the above conditions appear to occur in the Crawford Lake locale. At present, recent clearing and reforestation have produced the arrangements of cover that deer prefer during the summer season and prehistoric clearing for agricultural use would have produced the same conditions. More important, the diversity of habitat types produces both edge zones and areas in the bottomlands where deer can yard in the winter. This is the only habitat where white cedar occurs in sufficient numbers for food requirements, and where deer are protected from the worst of the winter weather.

If we conclude from the arguments presented above that the variety of physiography has been effectively constant over the past 700 years,

we can infer that the influence of this context on the natural communities was the same in the past ~~as it is~~ at present. By assuming that the geographical variation in local climatic conditions was constant, we may infer that the relative effects these have on flora and fauna would also have pertained in the past. The influence of temporal variation in regional climate, and the effects of an episode of cooler and/or drier conditions than exist at present would serve to restrict even further the fall and winter ranges of deer, and the habitat in the Crawford Lake locale would have been even more conducive to deer yarding.

It remains to examine the effects of recent land use on floral and faunal populations. As noted above, recent agricultural activity has not been as intense in the area of the escarpment as elsewhere in the region. There has been, however, a certain amount of clearing and reforestation that may have affected the diversity of plant and animal life, and the modern human population, although not dense, will certainly affect floral and, especially, faunal communities. The overall influence of modern human land use, however, tends to decrease variety, not to increase it. The alteration of the environment by human activities, such as the drainage of swamplands, is generally directed toward its use by one species, and not by a diversity of species. As far as Byrne's study of floral populations is concerned, he attempted to sample areas that have been least affected by the modern human settlement. Dasmann has commented on the effects that human settlement have had on populations of white-tailed deer:

> In spite of a common impression, white-tailed deer were not abundant in eastern Canada, northern New England, and in much of the forested region around the Great Lakes when the first settlers reached America.

> ... In the eastern United States white-tailed deer probably were most numerous in pre-colonial times around Indian towns, in burned areas, and in the prairie fringes of the eastern forest from Minnesota southward (Dasmann 1971, 23).

In other words, if the prehistoric deer population was low in general, an area of habitat diversity such as the Crawford Lake locale could have had a much higher concentration of deer than surrounding areas in the past.

4.2.5 Summary and Conclusions

In conclusion, the overall argument of this section is that the research area, and especially the Crawford Lake locale, is the scene of environmental diversity more pronounced than that of the surrounding region, and that this diversity existed 600 to 700 years ago. This diversity entails several factors that would make it economically attractive to prehistoric Iroquoian societies whose subsistence practices consisted of swidden agriculture supplemented with wild floral and faunal resources. As far as food production is concerned, Figure 8 demonstrates that the largest areas of Class 1 agricultural land are actually located below the escarpment, a situation that suggests that native communities dependent on cultivation should have chosen to locate their villages there. When the factors of length of growing season (Table 2) and drainage of soils (Table 1) are considered, however, it can be argued that an area that encompassed some tracts of Class 1, 2, and 3 capability combined with higher elevation to increase the length of growing season and well drained soils would more likely have been selected. This combination of factors is characteristic of the Crawford Lake locale. In addition, the locale is also characterized by a number of econiches including bottomland, escarpment slopes, limestone pave-

ment, glacial outwash and kame, and till moraine (Figure 6). These produce an abundant diversity of wild floral resources that would have been available to native collectors within a relatively small area. Lastly, the availability of deer as a major faunal resource exploited for hides as well as meat completes the scenario of the Crawford Lake locale as a local area that would have been highly conducive to Iroquoian economic practices. The relationships of the prehistoric human population to this diversity will be considered in the following sections.

4.3 The Archaeological Data Base

4.3.1 Summary of Previous Research

For historical reasons, the area of investigation centres around Crawford Lake, a small karst lake located on the Niagara Escarpment about 3 km. south of the village of Campbellville (see Figure 4). The concentration of archaeological research in the vicinity of Crawford Lake received its impetus from an ecological study that began in the early 1970s. It had been discovered that Crawford Lake is meromictic; that is, there is no significant natural outgoing drainage and, therefore, little natural turbulance in the lake (McAndrews and Boyko 1974). These conditions allowed the accumulation of varved sediments at the bottom of the lake. These sediments were sampled by J.A. McAndrews of the Royal Ontario Museum and palynological studies of the varves were undertaken by McAndrews, R. Byrne, and M. Boyko, with the objective of documenting past changes in vegetation and climate in the area of the lake (McAndrews and Boyko 1974). The most important result, in terms of the archaeology of the region, was the discovery of an increase in grass pollen, including that of maize (Zea mays) from varves apparently dating

between the thirteenth and seventeenth centuries A.D. This was interpreted as evidence of native corn fields and, by extension, of archaeological sites located within the immediate vicinity of the lake (Finlayson and Byrne 1975). In 1972, Byrne conducted a preliminary survey of the area surrounding the lake and found the Crawford Lake site, located approximately one-half km. northwest of the lake. This discovery stimulated McAndrews, Byrne, and W.D. Finlayson to initiate a multidisciplinary project in 1973 to study the biogeography, geology, palynology, and prehistory of the area. This ongoing project has concentrated so far on the archaeological resources of the area, but has also generated some interesting, although limited, data from the other disciplines.

In the following summary of the archaeology and prehistory of the research area, I will present a brief history of the investigations and a synthesis of culture-history as it was understood prior to the initiation of the present study. For the latter I will use Wright's Ontario Iroquois Tradition (Wright 1966) as the basis for cultural classification. This framework was used to express the relationships among the sites by the archaeologists, including myself, who did the research. The definition of these relationships was based, for the most part, on preliminary examination of artifacts and, especially classification of pottery according to MacNeish's typology (MacNeish 1952). The limitations of both the cultural classification and the typology have been discussed above, and will be pursued below in more detail with reference to the specific example of the research area.

From 1973 to the present, archaeological survey and site excavations have been conducted in the research area under the direction of W.D. Finlayson. The objectives of these investigations, for the most

part, have been those stipulated for the excavation at the Crawford Lake site:

> ... (1) to determine the size of the site in order to allow estimates to be made about population; (2) to obtain a sample of artifacts in order to place the site in the cultural-historical framework for the Ontario Iroquois (Wright 1966); and (3) to obtain floral and faunal remains to allow an investigation of the subsistence practices of the occupants of the site (Finlayson and Byrne 1975, 32).

The archaeological survey in the area was conducted by Ramsden in 1973, and by M. Brown and C. Turton under the direction of Finlayson from 1974 to 1986. To date, a total of 14 Iroquoian sites have been located through survey within a roughly ten km. radius of Crawford Lake (see Figure 5 for the locations of these sites relative to Crawford Lake). In addition, the previously investigated Bennett site (Wright and Anderson 1969) is located within this radius. Besides the Crawford Lake site, the newly found components include the Rife site, discovered in 1973 (Ramsden 1974), the Unick and Van Eden sites discovered in 1974 (Finlayson and Byrne 1976), the Pipeline, Plunge Pool, and Laurensen sites discovered in 1975 (Finlayson and Byrne 1976), the Chypchar and Retreat sites discovered in 1976 (Finlayson, Brown and Turton 1977), the Fermar site discovered in 1977 (Finlayson and Brown 1979), the H.& R., South Track, and Crawford Lake 2 sites discovered in 1983 (Finlayson 1984), and the Winking Bull site discovered in 1984 (Finlayson 1985a). Surface collections and/or test excavations of varying intensity have been conducted at all of these sites, and more intensive excavations have been undertaken at some of them.

Excavations at the Crawford Lake site were carried out by Finlayson in 1973 and 1974 (Finlayson and Byrne 1975). The project was continued in 1982 under the direction of D. Poulton (Poulton 1983), and again in

1983 by Finlayson with a field school from Erindale College; University of Toronto (Finlayson 1984). These excavations determined that the site encompassed an area of approximately one hectare and included up to nine longhouses. A limited artifact sample (including 153 rim sherds) was recovered. Preliminary analysis of the sample of rim sherds indicated that the site could be placed in the Middleport substage of the Ontario Iroquois Tradition. A date for the occupation of the site of between A.D. 1435 and 1459 was suggested by a peak in the amount of corn pollen in the varves of Crawford Lake from a single core sample (Finlayson and Byrne 1979). This date has yet to be confirmed by other varve counts from the lake or by radiocarbon dating.

In 1974, 1975, and 1976 test excavations were conducted at the Rife site by field schools from Erindale College (directed by A. Mohr) and from The University of Western Ontario (directed by Finlayson). Several undisturbed middens and a longhouse were excavated, yielding a relatively large artifact sample (including 518 rim sherds). Preliminary analysis of this sample indicated that the Rife site could be classified as a Middleport component older than the Crawford Lake site. The Rife site is about one hectare in size (Finlayson and Byrne 1976).

Salvage excavations were conducted at the Unick site in the spring of 1975, with myself as field supervisor. During the course of these excavations, portions of five longhouses were uncovered, and a relatively small artifact sample (including 81 rim sherds) was collected. Preliminary analysis of the rim sherds indicated that the Unick site is a Middleport component, somewhat older than the Crawford Lake site. The site is approximately one hectare in size (Finlayson, Brown, Smith, and Turton 1976).

The Van Eden site was subjected to limited test excavation of

midden deposits by Brown and Turton in 1975. It was surface collected and midden deposits were tested again by Brown, Turton, and myself in 1981. An small artifact sample (including 114 rim sherds) was recovered. The site was identified as a Middleport component and appears to be about one hectare in size (Finlayson, Brown, Smith and Turton 1976).

Test excavations of midden deposits were conducted at the Pipeline site in 1975 by Brown and Turton, and more intensive excavations were undertaken in 1977 by M. Busby as M.A. research (Busby 1979). A large artifact sample (including 464 rim sherds) was recovered during the course of these excavations, and it was determined that the site is about one hectare in size. Analysis of the artifacts indicated that the cultural affiliation of the site is prehistoric Neutral (Busby 1979).

In 1976, limited test excavations were conducted by Brown and Turton at the Retreat site. A very small sample of artifacts (including 38 rim sherds) was recovered from a disturbed midden. The extent of the site remains undetermined. Analysis of the rim sherds by Busby (1979) indicated that the site is a prehistoric Neutral component.

Test excavations were conducted at the Chypchar site in 1976 by Brown and Turton (Finlayson, Brown, and Turton 1976), by field schools under the direction of Finlayson in 1980 and 1981, and by myself in 1980 (Finlayson and Smith 1981; Finlayson 1983a). One large midden was almost completely removed, part of a second midden was excavated, and test trenches were dug across two longhouses. A fairly large sample of artifacts (including 250 rim sherds) is available. Because part of the site lies in a trailer park, the size remains indeterminate, but it is at least one half hectare in extent. Chypchar was initially thought to be an early prehistoric Neutral component (Finlayson and Smith 1981),

but a subsequent examination of the rim sherds by myself indicated that it is more likely Middleport.

The Plunge Pool, Laurensen, and Fermar sites have all undergone very limited examination. The site types and sizes remain unknown, and only preliminary cultural affiliations can be assigned. Plunge Pool was surface collected by Brown and Turton, but the artifact sample is extremely small. This component is either Middleport or prehistoric Neutral, and may be a small special function site (Finlayson, Brown, and Turton 1977). The Laurensen site was surface collected by Brown and Turton in 1975, but very little cultural material was recovered. The site is located less than one km. from the Bennett site (see Figure 5), and the artifacts indicate that it may be either a late Pickering or an early Middleport component (Finlayson and Byrne 1976). The Fermar site was surface collected by Brown and Turton in 1977. They recovered a sample which includes only one rim sherd. The artifacts indicated that this component is either Middleport or prehistoric Neutral (Finlayson and Brown 1979).

At the time of preparation of this dissertation, very little information was available for the South Track, H.& R., Crawford Lake 2, and Winking Bull sites. The artifacts recovered through surface collection of the South Track site indicated that it is at least one hectare in size and is possibly a Pickering village. Both the H.& R. and Winking Bull sites appear to be Middleport villages. The Crawford Lake 2 site is extremely small (possibly no more than 100-200 square metres) and may be a special purpose hamlet associated with the Crawford Lake site (Finlayson 1984; 1985a).

The above outline summarizes the archaeological investigations in

the Crawford Lake area that have been directed by Finlayson. There are, in addition, several other Iroquoian sites in the area that have been investigated through other agencies. Limited excavations were conducted at the Bennett site by Emerson in 1961 and by Wright in 1962 (Wright and Anderson 1969). These excavations exposed portions of seven longhouses, and part of a palisade. A fairly large artifact sample (including 372 rim sherds) was recovered. The site has been identified as a palisaded late Pickering village. The size is estimated to be about one hectare.

The Campbell site was investigated by a crew from McMaster University and by a field school from Erindale Collage, both in 1971. It has been identified as a prehistoric Neutral village (Busby 1979). The size of the site was not determined, but it appears to be fairly extensive (i.e. at least one hectare in extent). A relatively large artifact sample was recovered (including 335 rim sherds).

In 1969, a field school from Erindale College conducted test excavations at the Milton site. The site consisted of both prehistoric and historic Neutral components, but the historic component was destroyed by construction of a railway and roadbed (Finlayson 1969). A fairly large sample of artifacts, including 117 rim sherds, was recovered.

The Brown site was test excavated by another field school from Erindale College in 1970. A large sample of artifacts was recovered, but remains unanalyzed. The size of the site appears to be about one hectare. A preliminary examination of the artifacts indicated that the site is a historic Neutral component (Finlayson pers.comm.)

The Irving-Johnston site was test excavated by Brown in 1974. A preliminary analysis of the ceramics and bone artifacts conducted by Busby (1975) indicated that Irving-Johnston is a possible prehistoric Huron component, but this identification remains tentative. The exact

size of the site was not determined but it appears to be at least two hectares in extent.

In addition, graduate theses on five other sites in the general region indicate the extent of Iroquoian occupation of this area. These sites include Gunby, a Pickering village investigated by R. Rozel (1979), Hamilton, Hood, Bogle I, and Bogle II, historic Neutral sites investigated by P. Lennox (1981), and Christianson, an historic Neutral village investigated by W. Fitzgerald (1981).

The above brief outline summarizes the archaeological field work and data recovery that has been conducted as of 1984 in the area under consideration. In order to summarize the interpretations of prehistory in this area, we can apply Wright's framework of the Ontario Iroquois Tradition. Such an application serves two purposes: to provide a preliminary classification of the components under consideration as a basis for further analysis; and to provide a concrete example of how this framework can be employed in a local area, and, therefore, as a basis for evaluating it in a particular case study.

From the cultural affiliations identified for these components, it can be argued that all three stages of Wright's Ontario Iroquois Tradition are represented in the Crawford Lake area. The spatial relationship of the research area, in terms of Wright's framework, varies depending on the stage. In the Early Ontario Iroquois Stage, Wright proposes a bilineal division between the Glen Meyer and Pickering branches. The research area falls into the extreme westernmost distribution of the Pickering branch (Wright 1966, 23: Map 1). In fact, Wright employed the Bennett site as an example of a terminal Pickering component. Wright argues that the Early Stage ended with Pickering

conquering and absorbing Glen Meyer (cf. Noble 1975b). The fusion of Pickering and Glen Meyer resulted in the Uren substage of the Middle Ontario Iroquois Stage and the subsequent development of a cultural horizon across southern Ontario in the Middleport substage. The research area occupies a south central position in the spatial distribution of both Uren and the the Middleport horizon (Wright 1966, 55:.Map 2; 59: Map 3). The Middle Stage ended, according to Wright, with the re-emergence of a bilineal division between two major branches, the Huron-Petun and the Neutral-Erie, and the concomitant dissolution of the horizon. The resulting Late Ontario Iroquois Stage was characterized by a fairly widespread distribution of the branches in the prehistoric period (Wright 1966, 67: Map 4), and a much more restricted one as sites belonging to tribal groups coalesced during the historic period (Wright 1966, 68: Map 5). The research area occupies the northeasternmost limits of distribution of the Neutral division of the Neutral-Erie branch for both periods (compare with Figure 3).

The spatial pattern that emerges can be interpreted in two ways. In both, the research area occupied a central position during the Middle Stage. On the one hand, the research area occupied the extreme edges or frontiers of distribution during the Early and Late Stages if sharp limits are placed on the distributions. On the other hand, the research area occupied an area of transition during the Early and Late Stages if the limits are not regarded as rigid. When viewed from within the framework of the Ontario Iroquois Tradition, the implications of these two scenarios are very different from each other, and are quite important for our interpretation of development in this area.

Modifications have been suggested for Wright's chronology of the Ontario Iroquois Tradition (1966). For example, Noble (1975a) has

argued that the Early Stage began about A.D. 700 instead of A.D. 1000, and Kapches (1981) has proposed an extended terminal date for the Middle Stage of A.D. 1450 instead of A.D. 1400. Timmins, on the other hand, has recently completed a critical examination of radiocarbon dates available for Iroquoian sites (1985) that, for the most part, seems to support much of Wright's original chronology. Accordingly, this generalized temporal framework will be employed here.

A summary of the overall chronology and cultural affiliation according to Wright's framework can be presented as follows (only sites with established cultural affiliation are included):

(1) Early Ontario Iroquois Stage (A.D. 700 - 1300) - Pickering Branch:

Laurensen, South Track, Bennett, Gunby

(2) Middle Ontario Iroquois State (A.D. 1300 - 1400) -

Middleport Substage:

Crawford Lake, Rife, Unick, Van Eden, Chypchar, H.& R., Winking Bull

(3) Late Ontario Iroquois Stage (A.D. 1400 - 1650)

(a) Prehistoric Neutral:

Pipeline, Retreat, Campbell, Milton

(b) Prehistoric Huron:

Irving-Johnston?

(c) Historic Neutral:

Brown, Hamilton, Hood, Bogle I, Bogle II, Christianson.

The above is a relative chronology only. Very few chronometric dates are available for sites in the research area. Of these, Bennett and Gunby, both classified as Pickering, are given calibrated radiocarbon dates of c. A.D. 1315 and 1335 respectively by Timmins (1985, 88-89). As mentioned, the Crawford Lake site, classed as Middleport, is dated to

A.D. 1435 - 1459 by analysis of the varves from the Crawford Lake core (Finlayson and Byrne 1975). The historic Neutral sites have been dated to after A.D. 1600 through analysis of trade beads. The dates for the earlier sites are problematic in terms of Wright's chronology and indicate, as Timmins (1985, 162-165) has suggested, that both the Early and Middle Stages may have lasted longer in certain regions of Ontario, including in the Crawford Lake area. Unfortunately, because of the paucity of chronometric dates from the sites under consideration here, resolution of this problem is beyond the scope of this dissertation and our concern must remain with establishing a local relative chronology. It is evident, however, that we have a set of sites that span the period of Iroquoian development from about 400 to 700 years ago.

4.3.2 Sites and Artifact Samples

Proceeding from the above summary of research in the Crawford Lake area it is possible to examine some methodological assumptions concerning Iroquoian sites and artifacts. Those concerning sites pertain to an evaluation of the archaeological survey conducted. In order to accomplish this it is necessary to assess the degree to which the known components statistically represent a small or large proportion of the total population of sites in the locale. There are two approaches to survey that provide some certainty that most or all of the surviving sites in a particular area have been located. The first is to 'blanket' the area (i.e. every field and woodlot is inspected), such as was undertaken in the survey of the New Toronto International Airport area (Poulton 1979). In this case it is highly likely that most of the sites in the area have been found. Obviously, however, this approach is expensive and time-consuming. The second approach is to select certain

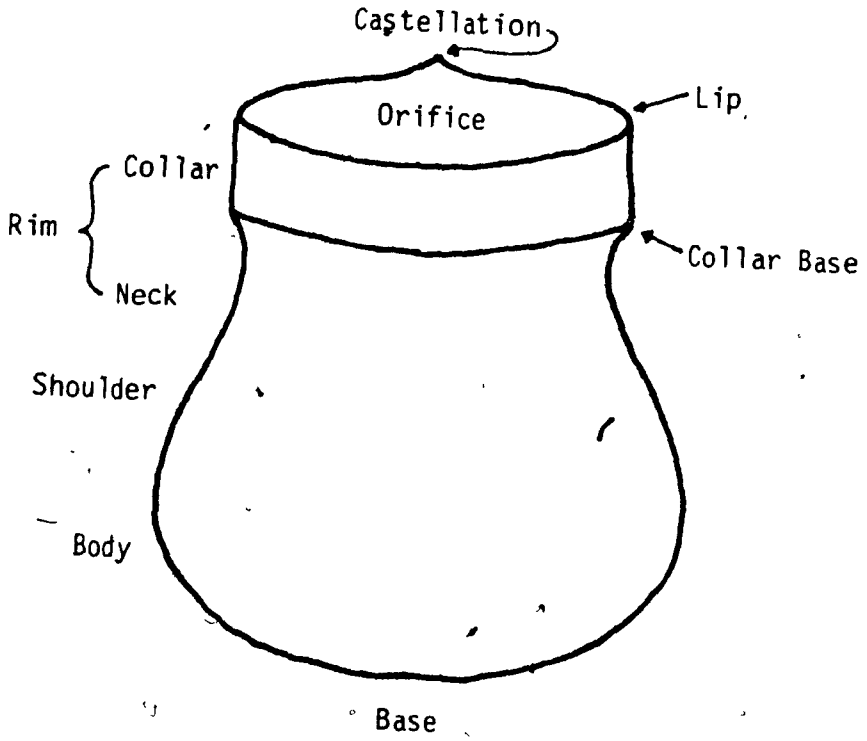
areas for examination based on prior knowledge of where sites are most likely to be located. For example, in the research area being examined in this study, potential locations of sites are limited by topography and drainage, and most of the prospective situations have been examined. Such a sampling procedure is subject to inherent biases and carries a lower probability of finding all surviving sites, but is an efficient use of limited resources. Variations of both of these approaches have been employed in the research area. In addition, the length of time (over ten years) and consistency of personnel conducting the survey heightens the probability that the sample of sites represents most of the Iroquoian components in the area.

Through the research described above, a number of assemblages of ceramic artifacts are available for analysis. The ideal situation would be, of course, if we could study whole pots and complete pipes. On Iroquoian sites, however, the occurrence of either is extremely rare. What generally remains are pottery sherds and pipe fragments, and we must select from among these pieces those we deem worthy of intensive study. The fragments are commonly identified according to the portion of the complete artifact from which they came. In Figure 9 below are sketches of an idealized Iroquoian pot and pipe, indicating the terminology employed to label different portions (see also Ramsden 1977, 62; Warrick 1984, 107). Archaeologists studying Iroquoian ceramics have concentrated analysis on the rim sections of pots and the bowl segments of pipes, for the simple reason that these are the areas where decoration is most likely to occur. This selection will be continued in the present study, for the same reason.

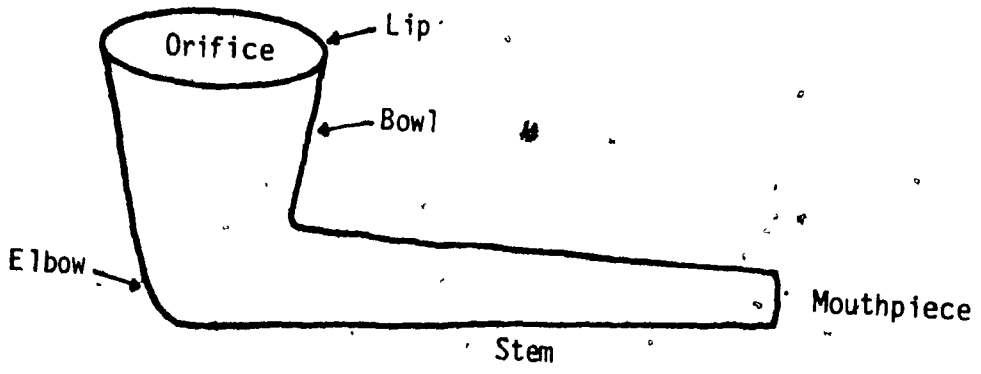
Both Wright and Ramsden argue that a rim sherd is appropriate for analysis if, and only if, all of the characteristics from a prescribed

Figure 9: Sketches of an Iroquoian Pot and Ceramic Smoking Pipe

Iroquoian Pot



Iroquoian Ceramic Smoking Pipe



list are present on the fragment (Ramsden 1977, 61-62; Wright 1980). These traits include "... an intact collar or upper rim, a portion of the neck, and an interior and lip" (Wright 1980, 21). This has been followed by other researchers (e.g. Warrick 1984, 122). All or most of these characteristics are necessary if one is to apply MacNeish's typology, but both Wright and Ramsden explicitly eschew the typological approach. Since neither researcher attempts to examine correlations among attributes associated with these parts of a rim sherd, it is not clear why such limits should be established at the outset (Smith 1983). In this study, only exterior design sequence (upper rim and neck decoration) was required for a sherd to be considered appropriate in the first stages of analysis, and further restrictions were applied only when attribute correlations were attempted.

With respect to pottery rim sherds, there has been some debate concerning whether to treat each fragment separately, or to attempt to group those together that appear to be fragments of the same vessel. Wright has argued that employing vessels is preferable to individual rim sherds on the grounds that:

> Any mathematical statement based upon rim sherds not reduced to the single vessel is biased, in an erratic fashion, since individual vessels will be represented by a variable number of specimens. Even when dealing with large collections of rim sherds the law of large numbers cannot be assumed applicable due to the fortuitous nature of vessel fragmentation, the non-randomness of garbage disposal, and the vagaries of archaeological recovery (1980, 22).

Wright supports his argument with the assumption that "The nature of Iroquoian ceramics is ideally suited to the task of isolating vessels from a mass of rim sherds with a high degree of confidence" (1980, 21). I agree with this assumption as well, with the proviso that the sorting must be conducted in a systematic and consistent manner by an

experienced analyst. This is not so important for discovering physical mends, but it is crucial for inferring that fragments that do not mend were part of the same vessel.

For purposes of this study, the following procedure for sorting was used for both rim sherds and pipe bowl fragments. The sherds and fragments were first sorted into exclusive groups that shared certain stylistic criteria. For ease, in this case, the groups consisted of the traditional types, MacNeish's for pottery and Emerson's for pipes. Each fragment was then physically compared to every other fragment in its group. This ensured that the sorting was systematic. To maintain consistency, the sorting was carried out entirely by the author. Although tedious and time-consuming, this procedure allows us to be certain that the sorting of fragments into rim and bowl sections is reasonably consistent.

At this point it is necessary to insert a comment about the terminology employed to refer to the parts of the ceramic artifacts used in this study. Wright, as noted above, refers to rim sherds and vessels. 'Vessel', in this case, however, does not refer to a whole pot, but simply to the section of a rim portion that has been recovered archaeologically. Since the term 'vessel' implies an entire pot, I suggest that it be reserved for use in analytic contexts where observations from whole pots are being undertaken. In this dissertation, 'rim sherd' refers to a fragment of the rim portion of a pot, and 'rim section' refers to all of the rim sherds that are inferred to have once been part of the same vessel, whether physical mends are present or not. The latter replaces 'vessel' as Wright has conceived it. Applying this line of reasoning to ceramic pipes, 'bowl fragment' refers to a single surviving piece of a pipe bowl, 'bowl section' refers

to all bowl fragments from a single pipe, and 'pipe' refers to the whole artifact.

As noted above, the archaeological research in the study area has concentrated largely on survey, and the testing of sites has been of a preliminary nature. There has not, to date, been extensive excavation conducted on any site, and there are no sites from which truly large samples of artifacts have been recovered. This immediately poses the problem of how well the artifact sample from each component reflects the nature of the total assemblage from the site. To evaluate this in the absence of total site excavation we must consider three different aspects of sampling: (1) absolute sample size, (2) area of a site that has been sampled, and (3) nature of the types of deposits sampled. For absolute sample size, there is much debate over exactly how large an assemblage from a single site must be before it can be considered adequate. As noted by Kapches (1981, 43-45), Iroquoianists studying ceramic artifacts have not established definite criteria for sample size. In general, researchers have argued that large sample sizes, (300 to 500 rim sherds) are preferable (e.g. MacNeish 1952, 92), but that, for practical purposes, much smaller samples (50 to 100 rim sherds) have to be considered because often these are all that are available. White, for example, stipulated a minimum of approximately 100 rim sherds for sample size for her study of Iroquoian sites in the Niagara Frontier region of New York State (1961, 7), although in actual fact the samples she excluded all consisted of less than fifty rim sherds (1961,8). In his examination of Iroquoian sites in Ontario, Wright (1966) used rim sherd assemblages ranging in size from 32 to 2,645, but did not directly address the problem of minimum sample size. Ramsden employed collections of rim sherds ranging in size from 36 to 885 in his study of

Huron sites, referring to "... the availability for study of an adequate sample" (1977, 65) without defining what he meant by adequate. Kapches settled on a minimum of fifty vessels in an assemblage for her analysis of Middleport ceramics (1981, 45), although she did not discuss specific reasons for this. Since the sizes of samples of rim sherds from sites in the research area of the present study (excluding those with less than ten sherds) range from 25 to 518, this problem had to be confronted. It was decided, for reasons discussed above, to base the evaluation of samples on rim sections, not on rim sherds, and that the evaluation of absolute sample size should be undertaken in conjunction with the other two aspects of sampling: area tested and type of deposit. In no case has the entire area of a site been thoroughly tested. This is especially true of those sites with large areas of undisturbed deposits. Those that were highly disturbed had surface collections taken from the entire area of the site, but the sample sizes from such sites tend to be low. For type of deposit, Iroquoian sites are generally divided into living floors of structures, pits, and middens. Significant amounts of material from all of these types of deposits should be recovered to ensure minimal representation of the sample (see Bellhouse and Finlayson 1979). Fortunately, many of the sites in the research area have had samples recovered from each of these deposit types.

For purposes of this study, all three of the aspects of sampling discussed above were considered in evaluating assemblages of ceramic artifacts. If a sample was judged to be strong for two of the criteria then the third was allowed to be less strong, within certain limits. For example, if a site had been tested over a large area and the assemblage had been recovered from all three of middens, living floors,

and pits, an absolute sample size of 50 rim sections was considered adequate. This judgement appears to be in accord with the experience of the researchers mentioned above.

Sites and assemblages were chosen for detailed study in this dissertation on the basis of two criteria: (1) statistical adequacy of samples for study according to the parameters discussed above; and (2) identification of relevant patterns of variation among the artifact samples. As noted previously, the inspiration for the analysis conducted here was a perceived formal anomaly among the smoking pipes. This anomaly was apparent only among those sites identified as either Middleport or prehistoric Neutral in the research area. This limited the selection of sites with respect to the second criterion. Of the eleven available sites so identified, eight were selected: Crawford Lake, Rife, Unick, Van Eden, Chypchar, Pipeline, Campbell, and Milton. The H.& R., Winking Bull, and Retreat sites were eliminated because of inadequate artifact samples. The artifact assemblages from the selected sites are described in the next section.

The resulting numbers of pottery rim sections and pipe bowl sections are presented in Table 3. For comparison, the ratio between rim and bowl sections is also tabulated. An unexpected pattern is apparent in these figures if the ratios of individual sites are compared to the ratio for the total of the entire collection. The ratios for Unick (0.30), Crawford Lake (0.24) and Van Eden (0.29) all group around the mean ratio (0.27). The ratios for Pipeline (0.18), Campbell (0.18) and Milton (0.19) are significantly lower than the mean, as well as being remarkably consistent. Most surprising, however, are the ratios for Rife (0.39) and Chypchar (0.47), which are much higher than the mean ratio. At first it was feared that this variation in ratios might be

due to sampling problems, a thought that caused some worry. A correlation between the ratios and the means of data recovery practiced on the sites could not, however, be established. The variation of ratios thus remains a pattern at the level of form.

Table 3: Frequencies of Rim and Bowl Sections + Ratios

SITES	NO. VESSELS	NO. PIPES	RATIO: PIPES/VESSELS
Unick	54	16	0.30
Rife	287	112	0.39
Crawford Lake	118	28	0.24
Van Eden	87	25	0.29
Chypchar	146	69	0.47
Pipeline	389	70	0.18
Campbell	175	31	0.18
Milton	100	19	0.19
TOTAL	1356	370	0.27

4.4 Formulation of Explanatory Model

4.4.1 Form

As a first step in describing the rim and bowl sections, the frequencies of traditional types were recorded and percentages calculated. Contrary to the practice of many researchers, untypable rim sections were excluded instead of being lumped into a category called 'other' or 'miscellaneous'. This was done because, methodologically, a 'miscellaneous' category is not of the same nature as an archaeological 'type'. Whether the typology is traditional or otherwise, the methodological assumption is that all of the artifacts in a single category such as Lawson Opposed are similar in some manner. With a category labelled 'miscellaneous', however, we must assume the opposite. Since 'miscellaneous' has often had a significant frequency in tabulations (e.g. Wright 1966, 147: Table 15), it can seriously bias any

statistical manipulation, such as a coefficient of similarity. In this study, a total of 49 rim sections (but no bowl sections) were excluded from typing because of this. These artifacts were, however, included in attribute analysis. The results of applying MacNeish's pottery typology to the rim sections are presented in Table 4. The dominant types are Lawson Opposed, Lawson Incised, Pound Necked, Ontario Horizontal, and Middleport Oblique. These types are identified by Wright as being characteristic of Middleport and prehistoric Neutral pottery (1966, 61; 85-86). Since the application of the typology was at least consistent, having been done entirely by the author, the identification of these types strengthens the initial inference of cultural affiliation, which was based on typological sorting performed by several other people.

The results of applying Emerson's pipe typology to the bowl sections are presented in Table 5. An anomaly is immediately apparent in these figures. Whereas the presence of the pottery types is distributed relatively evenly among the sites, such is not the case with the pipe types. There is no single pipe type that is important at each site; in fact, there is no single type that is even present at all of the sites. The most striking example can be seen in the percentages of the Plain Trumpet type. On the one hand, this type is not present on the Crawford Lake, Rife, Unick, and Van Eden sites. On the other hand, Plain Trumpet pipes account for from at least one-third to one-half of the bowl sections from the Chypchar, Campbell, Pipeline, and Milton sites. In terms of the three types that have the trumpet form (Plain Trumpet, Ring Trumpet, and Decorated Trumpet) only three occur in the first group of sites listed above, and all of these are from the Rife site. We have, then, two groups of sites that are separated at the level of form because of differences in pipe styles. To display this

Table 4: Frequencies of Types: MacNeish Pottery Types (excluding untypable vessels)

TYPES	SITES Unick N	%	Rife N	%	Cr. Lake N	%	Van Eden N	%
Lawson Opposed	0	0.00	4	1.45	3	2.59	0	0.00
Lawson Incised	1	1.96	7	2.54	8	6.90	8	9.76
Pound Necked	11	21.57	54	19.57	31	26.72	22	26.83
Pound Blank	0	0.00	0	0.00	0	0.00	0	0.00
Ontario Horizontal	14	27.45	89	32.25	35	30.17	19	23.17
Middleport Oblique	22	43.14	107	38.77	33	28.45	31	37.80
" Criss-Cross	3	5.88	12	4.35	3	2.59	1	1.22
Ontario Oblique	0	0.00	0	0.00	0	0.00	0	0.00
Iroquoian Linear	0	0.00	1	0.36	2	1.72	0	0.00
Ripley Plain	0	0.00	0	0.00	0	0.00	1	1.22
Niagara Collared	0	0.00	0	0.00	1	0.86	0	0.00
Huron Incised	0	0.00	2	0.72	0	0.00	0	0.00
Black Necked	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	51		276		116		82	

TYPES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Lawson Opposed	7	4.90	10	2.65	9	5.29	7	7.69
Lawson Incised	17	11.89	34	8.99	17	10.00	22	24.18
Pound Necked	27	18.88	95	25.13	79	46.47	39	42.86
Pound Blank	4	2.80	3	0.79	10	5.88	4	4.40
Ontario Horizontal	42	29.37	103	27.25	25	14.71	4	4.40
Middleport Oblique	40	27.97	125	33.07	26	15.29	10	10.99
" Criss-Cross	3	2.10	5	1.32	2	1.18	1	1.10
Ontario Oblique	1	0.70	0	0.00	0	0.00	0	0.00
Iroquoian Linear	1	0.70	0	0.00	0	0.00	0	0.00
Ripley Plain	0	0.00	2	0.53	0	0.00	0	0.00
Niagara Collared	0	0.00	1	0.26	1	0.59	1	1.10
Huron Incised	0	0.00	0	0.00	0	0.00	1	1.10
Black Necked	1	0.70	0	0.00	1	0.59	2	2.20
TOTAL	143		378		170		91	

Table 5: Frequencies of Types: Emerson Pipe Types

TYPES	SITES Unick N	Unick %	Rife N	Rife %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Iroquois Ring	1	6.25	5	4.46	7	25.00	0	0.00
Conical Plain	6	37.50	24	21.43	7	25.00	7	28.00
Conical Ring	2	12.50	37	33.04	9	32.14	8	32.00
Conical Decorated	2	12.50	15	13.39	1	3.57	7	28.00
Plain Trumpet	0	0.00	0	0.00	0	0.00	0	0.00
Ring Trumpet	0	0.00	3	2.68	0	0.00	0	0.00
Decorated Trumpet	0	0.00	0	0.00	0	0.00	0	0.00
Apple Bowl Plain	3	18.75	7	6.25	0	0.00	2	8.00
Apple Bowl Ring	0	0.00	1	0.89	0	0.00	0	0.00
Apple Bowl Decorat.	0	0.00	2	1.79	0	0.00	0	0.00
Cylindrical Plain	2	12.50	17	15.18	4	14.29	1	4.00
Cylindrical Ring	0	0.00	1	0.89	0	0.00	0	0.00
TOTAL	16		112		28		25	

TYPES	SITES Chypchar N	Chypchar %	Pipeline N	Pipeline %	Campbell N	Campbell %	Milton N	Milton %
Iroquois Ring	5	7.25	9	12.86	5	16.13	7	36.84
Conical Plain	10	14.49	7	10.00	1	3.23	0	0.00
Conical Ring	2	2.90	2	2.86	0	0.00	0	0.00
Conical Decorated	0	0.00	0	0.00	1	3.23	0	0.00
Plain Trumpet	42	60.87	35	50.00	20	64.52	7	36.84
Ring Trumpet	6	8.70	12	17.14	2	6.45	1	5.26
Decorated Trumpet	0	0.00	1	1.43	1	3.23	0	0.00
Apple Bowl Plain	2	2.90	0	0.00	1	3.23	0	0.00
Apple Bowl Ring	0	0.00	2	2.86	0	0.00	0	0.00
Apple Bowl Decorat.	0	0.00	0	0.00	0	0.00	0	0.00
Cylindrical Plain	2	2.90	0	0.00	0	0.00	4	21.05
Cylindrical Ring	0	0.00	2	2.86	0	0.00	0	0.00
TOTAL	69		70		31		19	

separation more clearly, Robinson-Brainerd (Robinson 1951) coefficients of similarity were calculated for both pottery and pipe types frequencies (Tables 6 and 7) and the sites were seriated using the Renfrew-Sterud Double-link technique (Renfrew and Sterud 1969). In these tables, and in all tables of Robinson-Brainerd coefficients of similarity that occur later in this thesis, the Double-link diagram is displayed after each table. The technique works by placing the sites with the highest coefficients of similarity next to each other. The links are indicated by arrows in the diagrams, and the coefficients of similarity between sites are placed above the arrows. In addition, Single-link dendrograms (Hodson 1969) were constructed (Figures 10 and 11). The separation of pipe forms between the two groups of sites is particularly clear in Figure 11 when compared to the more even distribution of coefficients of similarity for pottery types (Figure 10).

In order to provide a broader context for preliminary evaluation of the anomaly apparent in the pipe types presented above, frequencies of comparable data were assembled from as many other Middleport sites across southern Ontario as were readily available from both published and unpublished literature. Frequencies of MacNeish's pottery types were collected for the following sites from the sources indicated: Downsview (Emerson 1954); Drumholm and Edwards (Pearce 1984); Elliot, New, Millroy, Robb, and Thomson (Kapches 1981); Inverhuron, Kienuka, Middleport, and Pound (Wright 1966); Messenger (Smith 1983); Moyer (Wagner et al. 1973); Nodwell (Wright 1974); and Slack-Caswell (Jamieson 1979). These data are presented in Table 8. In addition, pipe data for all but four of these sites were collected; frequencies were not available for Inverhuron, Kienuka, and Middleport, and Slack-Caswell

Table 6: Coefficients of Similarity: MacNeish Pottery Types (excluding untypable vessels)

	UNI	RIF	CHY	CRA	PIP	VAN	CAM	MIL
UNI	------	184.19	156.73	164.03	170.34	171.45	109.41	80.03
RIF	184.19	------	165.34	170.24	170.38	168.59	109.45	81.52
CHY	156.73	165.34	------	177.01	175.72	162.00	136.68	111.29
CRA	164.03	170.24	177.01	------	183.80	172.92	135.94	107.10
PIP	170.34	170.38	175.72	183.80	------	184.23	138.01	108.63
VAN	171.45	168.59	162.00	172.92	184.23	------	135.52	106.14
CAM	109.41	109.45	136.68	135.94	138.01	135.52	------	160.41
MIL	80.03	81.52	111.29	107.10	108.63	106.14	160.41	------

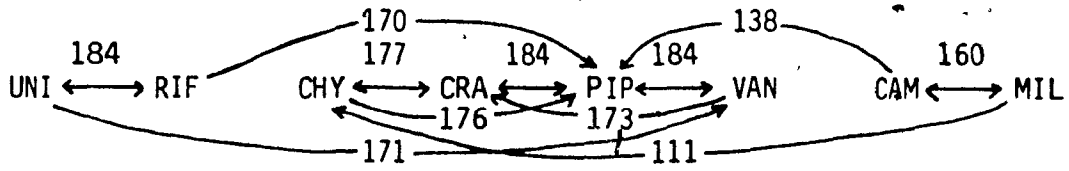
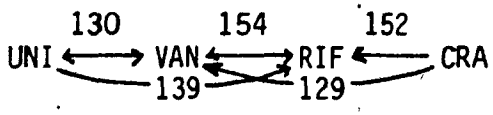


Table 7: Coefficients of Similarity: Emerson Pipe Types

	UNI	VAN	RIF	CRA	PIP	CHY	CAM	MIL
UNI	------	130.00	139.29	119.64	38.21	58.88	31.85	37.50
VAN	130.00	------	154.14	129.14	25.71	46.38	19.35	8.00
RIF	139.29	154.14	------	151.79	43.57	60.66	33.64	44.64
CRA	119.64	129.14	151.79	------	51.43	55.07	45.16	78.57
PIP	38.21	25.71	43.57	51.43	------	157.60	147.93	109.92
CHY	58.88	46.38	60.66	55.07	157.60	------	161.38	104.50
CAM	31.85	19.35	33.64	45.16	147.93	161.38	------	116.47
MIL	37.50	8.00	44.64	78.57	109.92	104.50	116.47	------



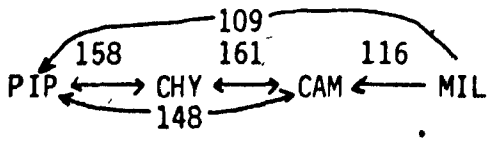


Figure 10: Dendrogram for MacNeish Pottery Types (excluding untypable rim sections)

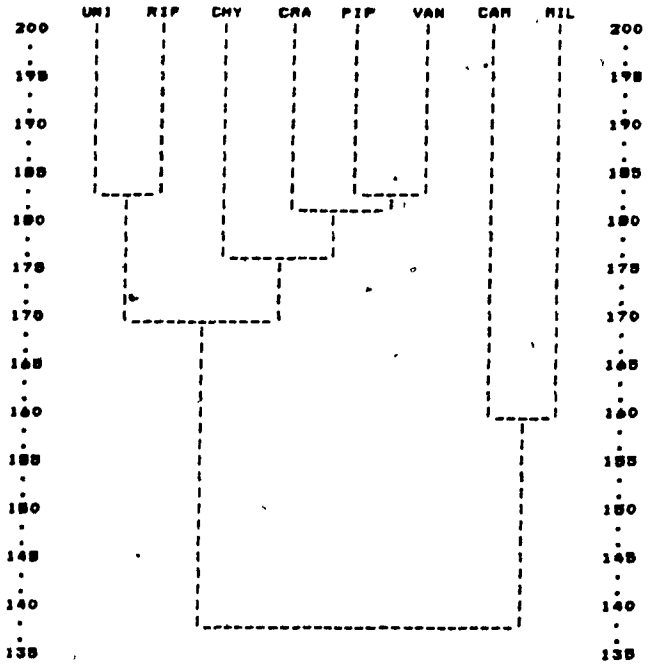


Figure 11: Dendrogram for Emerson Pipe Types

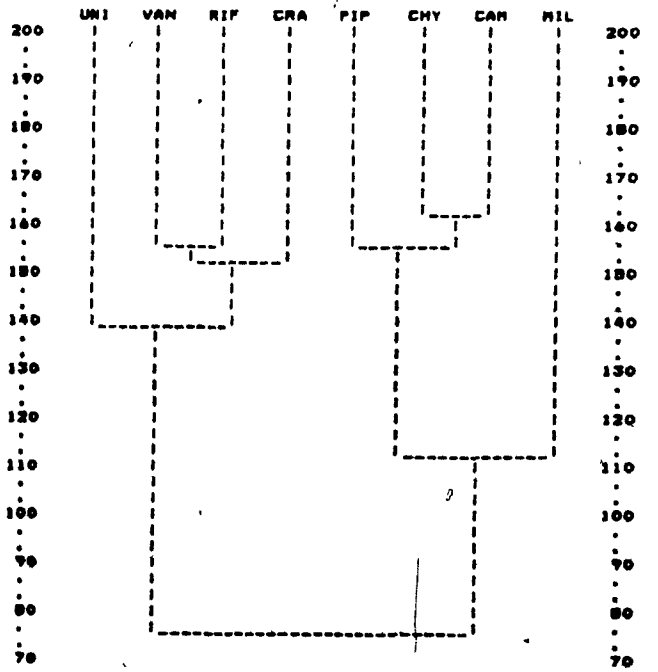


Table 8: Middleport Sites: MacNeish Pottery Types

	SITES							
	Thomson		Elliot		Middleport		Edwards	
TYPES	N	%	N	%	N	%	N	%
Lawson Opposed	0	0.00	0	0.00	0	0.00	1	2.06
Lawson Incised	1	1.41	0	0.00	37	12.24	3	6.19
Pound Necked	0	0.00	1	1.89	16	5.10	13	25.77
Pound Blank	0	0.00	0	0.00	0	0.00	1	2.06
Ontario Horizontal	21	29.58	25	64.15	117	38.78	14	26.80
Middleport Oblique	1	1.41	4	11.32	46	15.31	15	28.87
Middleport XX	0	0.00	3	7.55	53	17.35	0	0.00
Ontario Oblique	31	45.07	4	11.32	25	8.16	3	6.19
Uren Noded	3	4.23	0	0.00	0	0.00	0	0.00
Iroquoian Linear	9	12.68	0	0.00	0	0.00	0	0.00
Ripley P-lain	3	4.23	0	0.00	3	1.02	0	0.00
Niagara Collared	1	1.41	1	1.89	6	2.04	1	2.06
Warminster Crossed	0	0.00	0	0.00	0	0.00	0	0.00
Huron Incised	0	0.00	0	0.00	0	0.00	0	0.00
Warminster Horizontal	0	0.00	0	0.00	0	0.00	0	0.00
Seed Incised	0	0.00	0	0.00	0	0.00	0	0.00
Sidey Crossed	0	0.00	0	0.00	0	0.00	0	0.00
Black Necked	0	0.00	1	1.89	0	0.00	0	0.00
Onondaga Triangular	0	0.00	0	0.00	0	0.00	0	0.00
Lalonde Hi-Collared	0	0.00	0	0.00	0	0.00	0	0.00
Copeland Incised	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	70		70		303		52	

	SITES							
	Robb		New		Nodwell		Drumholm	
TYPES	N	%	N	%	N	%	N	%
Lawson Opposed	2	2.56	6	10.84	7	1.97	0	0.00
Lawson Incised	5	5.13	4	7.23	14	3.93	9	12.50
Pound Necked	16	15.38	6	10.84	81	22.75	25	35.42
Pound Blank	0	0.00	1	2.41	0	0.00	1	1.04
Ontario Horizontal	22	21.79	14	25.30	86	24.16	14	19.79
Middleport Oblique	36	34.62	12	21.69	36	10.11	13	18.75
Middleport XX	5	5.13	3	6.02	4	1.12	2	3.13
Ontario Oblique	3	3.85	0	0.00	3	0.84	5	7.29
Uren Noded	0	0.00	0	0.00	0	0.00	0	0.00
Iroquoian Linear	2	2.56	0	0.00	26	7.30	1	1.04
Ripley Plain	3	3.85	1	2.41	0	0.00	1	1.04
Niagara Collared	0	0.00	0	0.00	2	0.56	0	0.00
Warminster Crossed	0	0.00	0	0.00	1	0.28	0	0.00
Huron Incised	3	3.85	2	3.61	16	4.49	0	0.00
Warminster Horizontal	0	0.00	0	0.00	8	2.25	0	0.00
Seed Incised	0	0.00	0	0.00	0	0.00	0	0.00
Sidey Crossed	0	0.00	0	0.00	19	5.34	0	0.00
Black Necked	1	1.28	3	6.02	53	14.89	0	0.00
Onondaga Triangular	0	0.00	0	0.00	0	0.00	0	0.00
Lalonde Hi-Collared	0	0.00	2	3.61	0	0.00	0	0.00
Copeland Incised	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	38		54		356		74	

Table 8: Middleport Sites: MacNeish Pottery Types (cont.)

	SITES							
	Pound		Moyer		Slack-Caswell		Wiacek	
TYPES	N	%	N	%	N	%	N.	%
Lawson Opposed	0	0.00	20	3.98	0	0.00	6	6.59
Lawson Incised	47	7.00	76	15.11	7	17.95	6	6.59
Pound Necked	311	46.00	193	38.37	16	41.03	21	23.08
Pound Blank	20	3.00	29	5.77	1	2.56	5	5.49
Ontario Horizontal	162	24.00	56	11.13	2	5.13	7	7.69
Middleport Oblique	108	16.00	94	18.69	7	17.95	12	13.19
Middleport XX	20	3.00	21	4.17	5	12.82	2	2.20
Ontario Oblique	0	0.00	0	0.00	0	0.00	1	1.10
Uren Noded	0	0.00	0	0.00	0	0.00	0	0.00
Iroquoian Linear	0	0.00	0	0.00	0	0.00	2	2.20
Ripley Plain	0	0.00	1	0.20	0	0.00	1	1.10
Niagara Collared	7	1.00	11	2.19	1	2.56	2	2.20
Warminster Crossed	0	0.00	0	0.00	0	0.00	1	1.10
Huron Incised	0	0.00	0	0.00	0	0.00	4	4.40
Warminster Horizontal	0	0.00	0	0.00	0	0.00	0	0.00
Seed Incised	0	0.00	0	0.00	0	0.00	0	0.00
Sidey Crossed	0	0.00	0	0.00	0	0.00	1	1.10
Black Necked	0	0.00	2	0.40	0	0.00	13	14.29
Onondaga Triangular	0	0.00	0	0.00	0	0.00	0	0.00
Lalonde Hi-Collared	0	0.00	0	0.00	0	0.00	4	4.40
Copeland Incised	0	0.00	0	0.00	0	0.00	3	3.30
TOTAL	675		503		39		91	

	SITES							
	Millroy		Messenger		Inverhuron		Kienuka	
TYPES	N	%	N	%	N	%	N	%
Lawson Opposed	5	8.70	11	7.14	14	6.12	3	2.86
Lawson Incised	6	11.59	23	14.94	52	22.45	15	15.71
Pound Necked	1	1.45	91	59.09	24	10.20	0	0.00
Pound Blank	1	1.45	1	0.65	0	0.00	0	0.00
Ontario Horizontal	2	4.35	6	3.90	21	9.18	20	21.43
Middleport Oblique	7	13.04	2	1.30	28	12.24	16	17.14
Middleport XX	0	0.00	1	0.65	0	0.00	0	0.00
Ontario Oblique	0	0.00	0	0.00	5	2.04	1	1.43
Uren Noded	0	0.00	0	0.00	0	0.00	0	0.00
Iroquoian Linear	0	0.00	0	0.00	7	3.06	10	11.43
Ripley Plain	0	0.00	10	6.49	9	4.08	1	1.43
Niagara Collared	2	4.35	9	5.84	0	0.00	3	2.86
Warminster Crossed	0	0.00	0	0.00	0	0.00	0	0.00
Huron Incised	6	11.59	0	0.00	12	5.10	24	25.71
Warminster Horizontal	0	0.00	0	0.00	0	0.00	0	0.00
Seed Incised	2	4.35	0	0.00	12	5.10	0	0.00
Sidey Crossed	0	0.00	0	0.00	9	4.08	0	0.00
Black Necked	18	33.33	0	0.00	7	3.06	0	0.00
Onondaga Triangular	1	1.45	0	0.00	0	0.00	0	0.00
Lalonde Hi-Collared	2	4.35	0	0.00	30	13.27	0	0.00
Copeland Incised	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	53		154		231		93	

Table 8: Middleport Sites: MacNeish Pottery Types (cont.)

	SITES	
	Downsview	
TYPES	N	%
Lawson Opposed	7	9.33
Lawson Incised	56	74.67
Pound Necked	6	8.00
Pound Blank	0	0.00
Ontario Horizontal	0	0.00
Middleport Oblique	0	0.00
Middleport XX	0	0.00
Ontario Oblique	0	0.00
Uren Noded	0	0.00
Iroquoian Linear	0	0.00
Ripley Plain	0	0.00
Niagara Collared	3	4.00
Warminster Crossed	1	1.33
Huron Incised	0	0.00
Warminster Horizontal	0	0.00
Seed Incised	0	0.00
Sidey Crossed	0	0.00
Black Necked	0	0.00
Onondaga Triangular	0	0.00
Lalonde Hi-Collared	2	2.67
Copeland Incised	0	0.00
TOTAL	75	

yielded only three analyzable pipe bowls. In order to make all the pipe data comparable the forms of the pipes were tabulated instead of types, since not all pipes had been typed according to Emerson's framework. The pipe form data are presented in Table 9. Coefficients of similarity were calculated using the percentages of pottery types and pipe forms and the sites were seriated using these coefficients (Tables 10 and 11). Finally, the relationships among the sites are displayed graphically using single link dendrograms in Figures 12 and 13.

The results from this examination demonstrate a pattern that is remarkably similar to that discovered among the sites in the Crawford Lake area. Whereas the dendrogram for pottery types (Figure 12) shows a more-or-less continuous pattern of variation among the sites, the dendrogram for pipe forms (Figure 13) shows two very distinct groups of sites, with the sole exception of the Elliot site. Through examination of the geographical distribution of these sites displayed in Figure 3 it is apparent that these two groups of sites are not reflected spatially. It is clear, therefore, that the anomaly of pipe styles identified in the area around Crawford Lake is not an isolated occurrence, since the distinction can be seen among sites across southcentral and southwestern Ontario. In addition, if the order of sites based on seriation of MacNeish's pottery types displayed in Table 10 is considered to be of chronological significance in even a limited sense, it is apparent that these two groups are not separated temporally; that is, one group of sites is not earlier than the other. A model to explain this anomaly as manifested in the research area will be proposed in sections below, and tested in Chapter 5.0. The ramifications of this explanation for the more widespread pattern are considered in Chapter 6.0.

Table 9: Middleport Sites: Pipe Forms

	Elliot		Robb		Crawford L.		Edwards	
Barrel	11	100.00	17	54.84	11	39.29	4	28.57
Bulbous	0	0.00	0	0.00	0	0.00	0	0.00
Conical	0	0.00	12	38.71	17	60.71	10	71.43
Trumpet	0	0.00	2	6.45	0	0.00	0	0.00
Vasiform	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	11		31		28		14	

	Rife		Unick		Van Eden		Drumholm	
Barrel	23	20.54	3	18.75	1	3.23	0	0.00
Bulbous	10	8.93	3	18.75	2	6.45	0	0.00
Conical	76	67.86	10	62.50	28	90.32	5	83.33
Trumpet	3	2.68	0	0.00	0	0.00	1	16.67
Vasiform	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	112		16		31		6	

	Pound		Nodwell		Wiacek		Millroy	
Barrel	0	0.00	6	12.00	6	12.77	0	0.00
Bulbous	0	0.00	0	0.00	0	0.00	0	0.00
Conical	44	70.97	32	64.00	22	46.81	2	33.33
Trumpet	18	29.03	8	16.00	17	36.17	4	66.67
Vasiform	0	0.00	4	8.00	2	4.26	0	0.00
TOTAL	62		50		47		6	

	Chipchar		Pipeline		Moyer		Campbell	
Barrel	7	10.14	11	15.71	25	17.86	5	16.13
Bulbous	2	2.90	2	2.86	0	0.00	1	3.23
Conical	12	17.39	9	12.86	18	12.86	2	6.45
Trumpet	48	69.57	48	68.57	96	68.57	23	74.19
Vasiform	0	0.00	0	0.00	1	0.71	0	0.00
TOTAL	69		70		140		31	

	Messenger		Downsview		New		Milton	
Barrel	4	33.33	18	41.86	8	40.00	11	57.89
Bulbous	0	0.00	4	9.30	0	0.00	0	0.00
Conical	2	16.67	6	13.95	3	15.00	0	0.00
Trumpet	6	50.00	14	32.56	5	25.00	8	42.11
Vasiform	0	0.00	1	2.33	4	20.00	0	0.00
TOTAL	12		43		20		19	

Table 10: Coefficients of Similarity for Middleport Sites: MacNeish Pottery Types

	Thomson	Elliot	Middle	Unick	Rife	Van Eden	Pipeline
Thomson	-----	87.43	85.97	60.54	65.51	54.41	61.72
Elliot	87.43	------	142.93	96.86	103.38	78.97	87.86
Middleport	85.97	142.93	------	111.40	120.53	111.15	117.54
Unick	60.54	96.86	111.40	------	184.19	171.45	170.34
Rife	65.51	103.38	120.53	184.19	------	170.04	171.83
Van Eden	54.41	78.97	111.15	171.45	170.04	------	184.23
Pipeline	61.72	87.86	117.54	170.34	171.83	184.23	------
Crawford L.	69.96	97.43	121.85	164.03	171.69	172.92	183.80
Edwards	74.43	99.94	123.25	158.40	159.89	167.99	180.22
Chypchar	67.17	94.52	128.93	158.12	168.16	163.40	177.12
Robb	69.74	91.73	122.34	160.33	164.99	168.98	169.84
New	61.06	92.84	127.19	143.40	145.83	147.84	156.28
Nodwell	75.86	85.64	105.15	122.34	124.56	139.33	146.86
Drumholm	63.97	90.61	127.76	130.39	129.71	154.78	150.63
Pound	55.63	86.19	110.82	133.06	131.65	148.44	149.03
Campbell	36.22	63.13	93.73	109.41	110.90	135.52	138.01
Moyer	31.11	64.58	100.40	115.05	116.54	135.65	138.35
Slack-Cas.	18.71	59.31	105.29	104.98	100.50	121.76	119.17
Wiacek	32.63	55.94	86.66	93.21	95.43	119.57	121.12
Milton	16.62	42.71	69.86	80.03	81.52	106.14	108.63
Millroy	17.15	42.66	73.56	81.84	83.33	107.95	110.44
Messenger	24.47	23.01	52.50	58.75	60.24	87.30	88.12
Inverhuron	42.37	52.64	83.67	73.31	79.53	91.34	93.73
Kienuka	79.88	72.13	106.94	81.06	87.29	99.09	102.01
Downsview	5.63	11.32	38.78	19.92	25.42	35.51	39.81

Table 10: Coefficients of Similarity for Middleport Sites: MacNeish Pottery Types (cont.)

	Crawford	Edwards	Chypchar	Robb	New	Nodwell	Drumholm
Thomson	69.96	74.43	67.17	69.74	61.06	75.86	63.97
Elliot	97.43	99.94	94.52	91.73	92.84	85.64	90.61
Middleport	121.85	123.25	128.93	122.34	127.19	105.15	127.76
Unick	164.03	158.40	158.12	160.33	143.40	122.34	130.39
Rife	171.69	159.89	168.16	164.99	145.83	124.56	129.71
Van Eden	172.92	167.99	163.40	168.98	147.84	139.33	154.78
Pipeline	183.80	180.22	177.12	169.84	156.28	146.86	150.63
Crawford L.	------	180.27	178.41	161.36	151.85	151.03	151.58
Edwards	180.27	------	170.73	158.84	148.33	143.69	155.46
Chypchar	178.41	170.73	------	162.94	168.20	138.03	149.10
Robb	161.36	158.84	162.94	------	158.45	127.00	146.47
New	151.85	148.33	168.20	158.45	------	127.60	142.92
Nodwell	151.03	143.69	138.03	127.00	127.60	------	153.51
Drumholm	151.58	155.46	149.10	146.47	142.92	153.51	------
Pound	154.14	150.04	142.95	128.92	138.55	160.88	164.50
Campbell	135.94	133.34	136.90	118.76	131.50	149.07	155.27
Moyer	138.95	135.93	140.32	124.80	136.58	141.93	164.21
Slack-Cas.	120.29	118.32	118.41	107.69	118.44	125.99	150.32
Wiacek	123.74	120.24	125.27	111.36	129.01	143.33	147.41
Milton	107.10	105.13	111.29	89.38	108.59	128.40	130.88
Millroy	108.92	109.85	110.41	91.19	117.72	120.40	131.43
Messenger	85.83	83.85	85.71	75.79	87.51	108.88	110.90
Inverhuron	91.80	89.96	105.75	109.37	115.37	101.88	102.64
Kienuka	101.28	100.62	109.43	111.06	107.40	101.28	105.89
Downsview	36.69	36.62	49.57	39.08	61.69	38.47	41.00

Table 10: Coefficients of Similarity for Middleport Sites: (cont.) MacNeish Pottery Types

	Pound	Campbell	Moyer	Slack	Wiacek	Milton	Millroy
Thomson	55.63	36.22	31.11	18.71	32,63	16.62	17.15
Elliot	86.19	63.13	64.58	59.31	55.94	42.71	42.66
Middleport	110.82	93.73	100.40	105.29	86.66	69.86	73.56
Unick	133.06	109.41	115.05	104.98	93.21	80.03	81.84
Rife	131.65	110.90	116.54	100.50	95.43	81.52	83.33
Van Eden	148.44	135.52	135.65	121.76	119.57	106.14	107.95
Pipeline	149.03	138.01	138.35	119.17	121.12	108.63	110.44
Crawford L.	154.14	135.94	138.95	120.29	123.74	107.10	108.92
Edwards	150.04	133.34	135.93	118.32	120.24	105.13	109.85
Chypchar	142.95	136.90	140.32	118.41	125.27	111.29	110.41
Robb	128.92	118.76	124.80	107.69	111.36	89.38	91.19
New	138.55	131.50	136.58	118.44	129.01	108.59	117.72
Nodwell	160.88	149.07	141.93	125.99	143.33	128.40	120.40
Drumholm	164.50	155.27	164.21	150.32	147.41	130.88	131.43
Pound	------	175.53	159.80	151.44	142.88	145.08	123.25
Campbell	175.53	------	173.40	151.55	161.59	163.63	139.01
Moyer	159.80	173.40	------	171.76	166.57	159.66	149.79
Slack-Cas.	151.44	151.55	171.76	------	147.25	158.24	148.27
Wiacek	142.88	161.59	166.57	147.25	------	153.85	155.50
Milton	145.08	163.63	159.66	158.24	153.85	------	167.10
Millroy	123.25	139.01	149.79	148.27	155.50	167.10	------
Messenger	120.99	138.87	133.12	130.04	129.47	149.45	134.11
Inverhuron	83.39	99.98	107.96	97.17	120.41	120.09	135.73
Kienuka	90.86	86.89	97.26	85.57	82.64	89.23	92.59
Downsview	32.00	47.76	58.54	57.03	63.09	84.13	93.10

Table 10: Coefficients of Similarity for Middleport Sites: MacNeish Pottery Types (cont.)

	Messenger	Inverhur	Kienuka	Downsview
Thomson	24.47	42.37	79.88	5.63
Elliot	23.01	52.64	72.13	11.32
Middleport	52.50	83.67	106.94	38.78
Unick	58.75	73.31	81.06	19.92
Rife	60.24	79.53	87.29	25.42
Van Eden	87.30	91.34	99.09	35.51
Pipeline	88.12	93.73	102.01	39.81
Crawford L.	85.83	91.80	101.28	36.69
Edwards	83.85	89.96	100.62	36.62
Chypchar	85.71	105.75	109.43	49.57
Robb	75.79	109.37	111.06	39.08
New	87.51	115.37	107.40	61.69
Nodwell	108.88	101.88	101.28	38.47
Drumholm	110.90	102.64	105.89	41.00
Pound	120.99	83.39	90.86	32.00
Campbell	138.87	99.98	86.89	47.76
Moyer	133.12	107.96	97.26	58.54
Slack-Cas.	130.04	97.17	85.57	57.03
Wiacek	129.47	120.41	82.64	63.09
Milton	149.45	120.09	89.23	84.13
Millroy	134.11	135.73	92.59	93.10
Messenger	------	87.20	54.55	68.16
Inverhuron	87.20	------	115.51	88.68
Kienuka	54.55	115.51	------	94.29
Downsview	68.16	88.68	94.29	------

Table 11: Coefficients of Similarity for Middleport Sites: Pipe Forms

	Elliot	Robb	Crawford	Edwards	Rife	Unick	Van Eden
Elliot	------	109.68	78.57	57.14	41.07	37.50	6.45
Robb	109.68	------	155.99	134.56	123.85	114.92	83.87
Crawford L.	78.57	155.99	------	178.57	162.50	158.93	127.88
Edwards	57.14	134.56	178.57	------	176.79	162.50	149.31
Rife	41.07	123.85	162.50	176.79	------	180.36	155.07
Unick	37.50	114.92	158.93	162.50	180.36	------	144.35
Van Eden	6.45	83.87	127.88	149.31	155.07	144.35	------
Drumholm	0.00	90.32	121.43	142.86	141.07	125.00	166.67
Pound	0.00	90.32	121.43	141.94	141.07	125.00	141.94
Nodwell	24.00	114.32	145.43	152.00	157.36	149.00	134.45
Wiacek	25.53	115.85	119.15	119.15	124.51	119.15	100.07
Millroy	0.00	79.57	66.67	66.67	72.02	66.67	66.67
Chypchar	20.29	67.98	55.07	55.07	66.23	60.87	47.03
Pipeline	31.43	70.05	57.14	57.14	68.21	62.86	37.88
Moyer	35.71	74.33	61.43	61.43	66.79	61.43	32.17
Campbell	32.26	58.06	45.16	45.16	56.97	51.61	25.81
Messenger	66.67	112.90	100.00	90.48	79.76	70.83	39.78
Downsview	83.72	124.53	106.48	85.05	92.19	84.01	47.26
New	80.00	122.90	108.57	87.14	76.43	67.50	36.45
Milton	115.79	122.58	78.57	57.14	46.43	37.50	6.45

	Drumholm	Pound	Nodwell	Wiacek	Millroy	Chypchar	Pipeline
Elliot	0.00	0.00	24.00	25.53	0.00	20.29	31.43
Robb	90.32	90.32	114.32	115.85	79.57	67.98	70.05
Crawford L.	121.43	121.43	145.43	119.15	66.67	55.07	57.14
Edwards	142.86	141.94	152.00	119.15	66.67	55.07	57.14
Rife	141.07	141.07	157.36	124.51	72.02	66.23	68.21
Unick	125.00	125.00	149.00	119.15	66.67	60.87	62.86
Van Eden	166.67	141.94	134.45	100.07	66.67	47.03	37.88
Drumholm	------	175.27	160.00	126.95	100.00	68.12	59.05
Pound	175.27	------	160.00	151.68	124.73	92.85	83.78
Nodwell	160.00	160.00	------	158.13	98.67	87.07	81.71
Wiacek	126.95	151.68	158.13	------	139.01	127.41	123.59
Millroy	100.00	124.73	98.67	139.01	------	168.12	159.05
Chypchar	68.12	92.85	87.07	127.41	168.12	------	188.86
Pipeline	59.05	83.78	81.71	123.59	159.05	188.86	------
Moyer	59.05	83.78	83.14	125.02	159.05	183.15	194.29
Campbell	46.24	70.97	68.90	110.78	146.24	178.12	187.19
Messenger	66.67	91.40	89.33	131.21	133.33	153.62	157.14
Downsview	61.24	85.97	88.56	123.21	93.02	119.11	127.97
New	63.33	80.00	102.00	114.04	80.00	100.29	107.14
Milton	33.33	58.06	56.00	97.87	84.21	104.50	115.64

Table 11: Coefficients of Similarity for Middleport Sites: Pipe Forms (cont.)

	Moyer	Campbell	Messenger	Downsview	New	Milton
Elliot	35.71	32.26	66.67	83.72	80.00	115.79
Robb	74.33	58.06	112.90	124.53	122.90	122.58
Crawford L.	61.43	45.16	100.00	106.48	108.57	78.57
Edwards	61.43	45.16	90.48	85.05	87.14	57.14
Rife	66.79	56.97	79.76	92.19	76.43	46.43
Unick	61.43	51.61	70.83	84.01	67.50	37.50
Van Eden	32.17	25.81	39.78	47.26	36.45	6.45
Drumholm	59.05	46.24	66.67	61.24	63.33	33.33
Pound	83.78	70.97	91.40	85.97	80.00	58.06
Nodwell	83.14	68.90	89.33	88.56	102.00	56.00
Wiacek	125.02	110.78	131.21	123.21	114.04	97.87
Millroy	159.05	146.24	133.33	93.02	80.00	84.21
Chypchar	183.15	178.12	153.62	119.11	100.29	104.50
Pipeline	194.29	187.19	157.14	127.97	107.14	115.64
Moyer	------	182.30	161.43	127.97	112.86	119.92
Campbell	182.30	------	145.16	116.73	95.16	116.47
Messenger	161.43	145.16	------	159.69	146.67	150.88
Downsview	127.97	116.73	159.69	------	162.56	148.84
New	112.86	95.16	146.67	162.56	------	130.00
Milton	119.92	116.47	150.88	148.84	130.00	------

Figure 12: Dendrogram of Middleport Sites: MacNeish Pottery Types

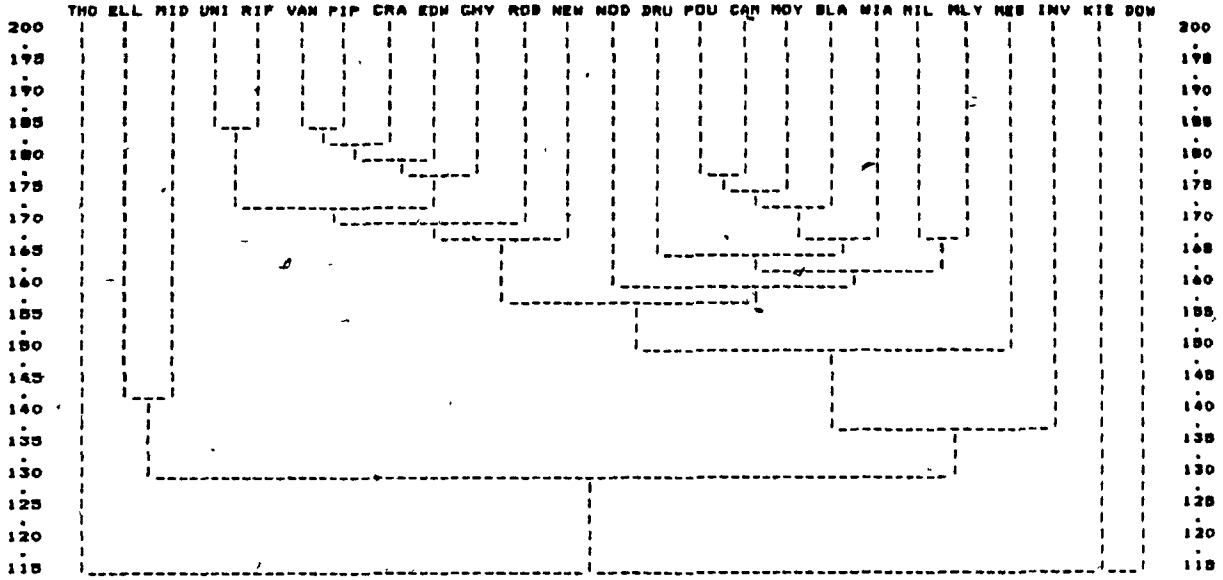
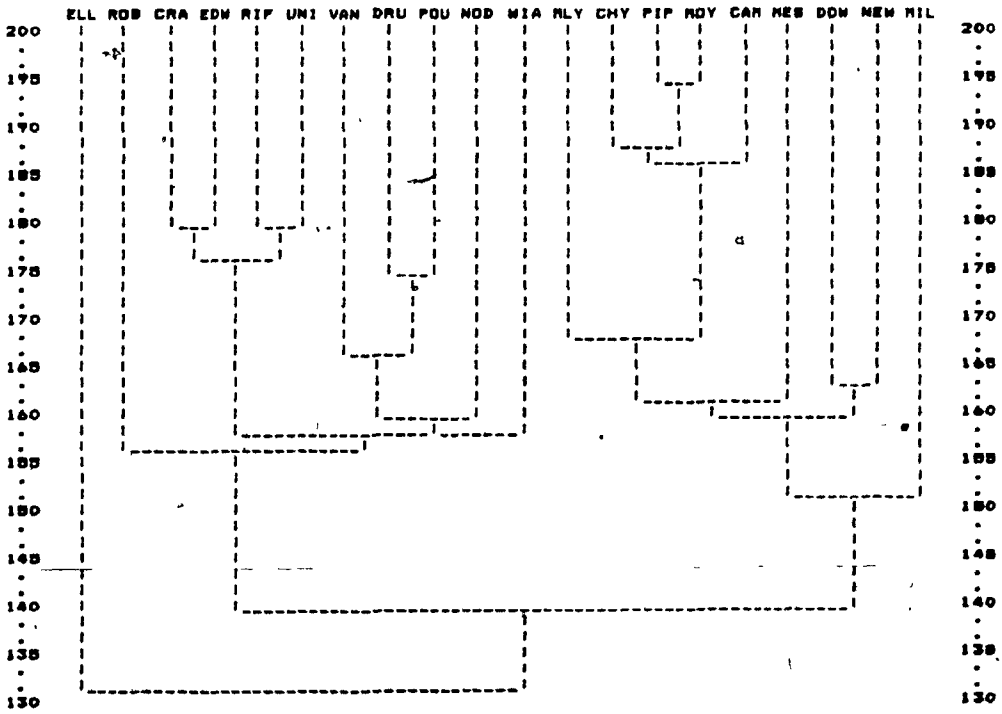


Figure 13: Dendrogram of Middleport Sites: Pipe Forms



4.4.2 Space and Time: A Preliminary Assessment of Culture-History

In the sections above, the information available at the level of form for the physical entities, the sites and artifacts, in the research area was summarized. It is now necessary to consider some relevant assumptions and inferences that can be drawn from this information. Since the methodology of this dissertation advocates evaluating assumptions and inferences within a systematic framework of levels of inference, we will initiate the process with an examination of the spatial and temporal contexts of the sites in the research area. The objective of this section is to construct a preliminary model of culture-history, using physical entities, that can be evaluated and modified later using analytical entities.

We can begin the investigation of spatial relationships and pattern by examining Figure 4, which shows the locations of all the known sites in the research area. It is immediately apparent that the locations of these sites are not randomly distributed. Some of them seem to occur in clusters. To investigate this, a variety of cluster analysis was performed on the distribution of the sites. Taking each site separately, the distance to its nearest neighbour was measured. The mean distance of a site to its nearest neighbour was determined to be approximately 1.5 km. (with a range of 0.5 to 3.5 km.). This mean distance was applied to the distribution by eliminating any site whose distance to its nearest neighbour was greater than 1.5 km., leaving a number of pairs of sites. Finally, any pair of sites was eliminated if both of the sites were further than 1.5 km. from any site in any other pair. The steps in this procedure are illustrated in Figures 14, 15, and 16. The result of this procedure was to isolate two distinct clusters of sites (Figure 16). One group consists of the Hamilton,

Figure 14: Map of Research Area Showing Distance to Nearest Neighbour Measurements between Sites

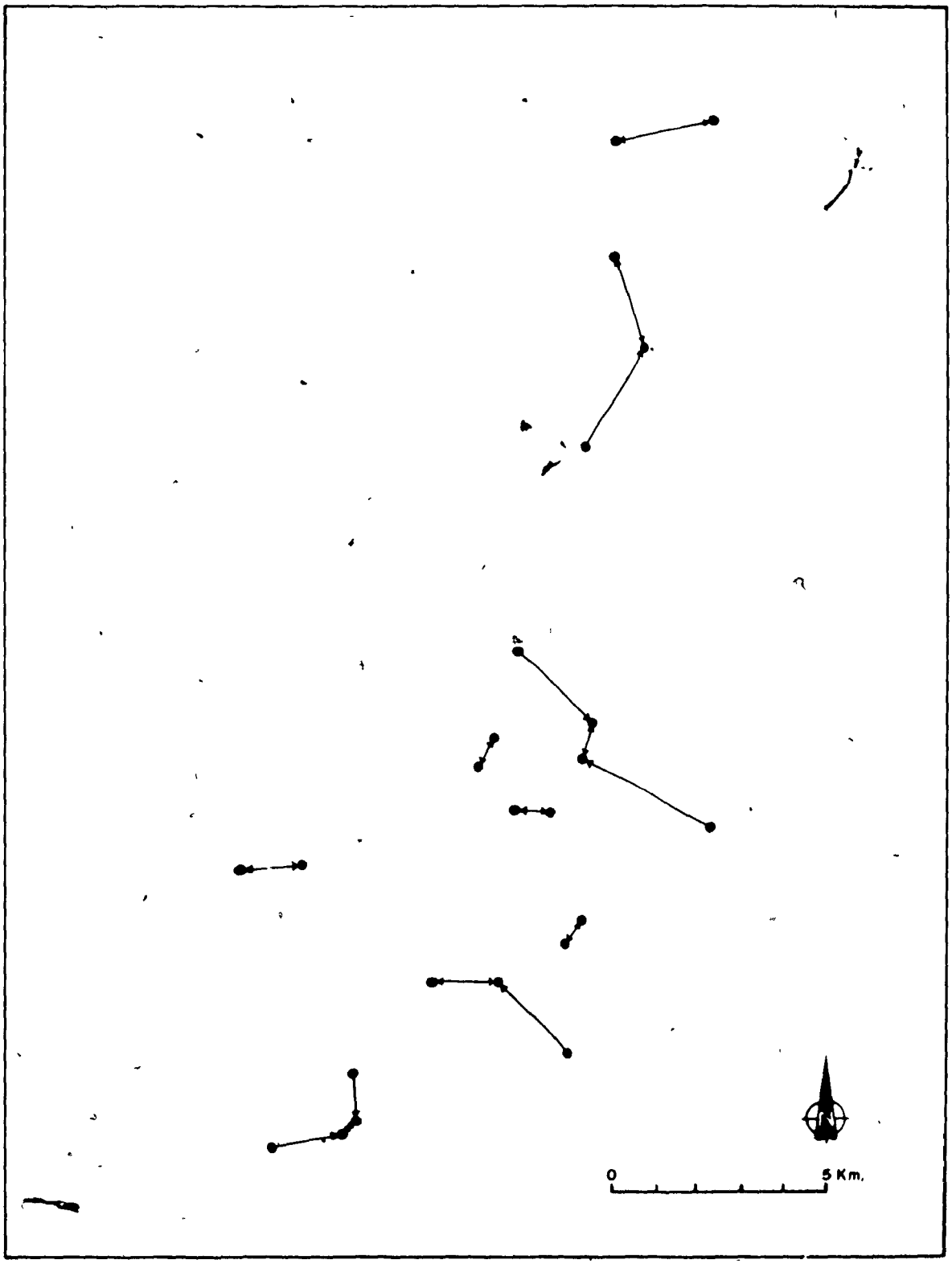


Figure 15: Map of Research Area Showing Site Pairs

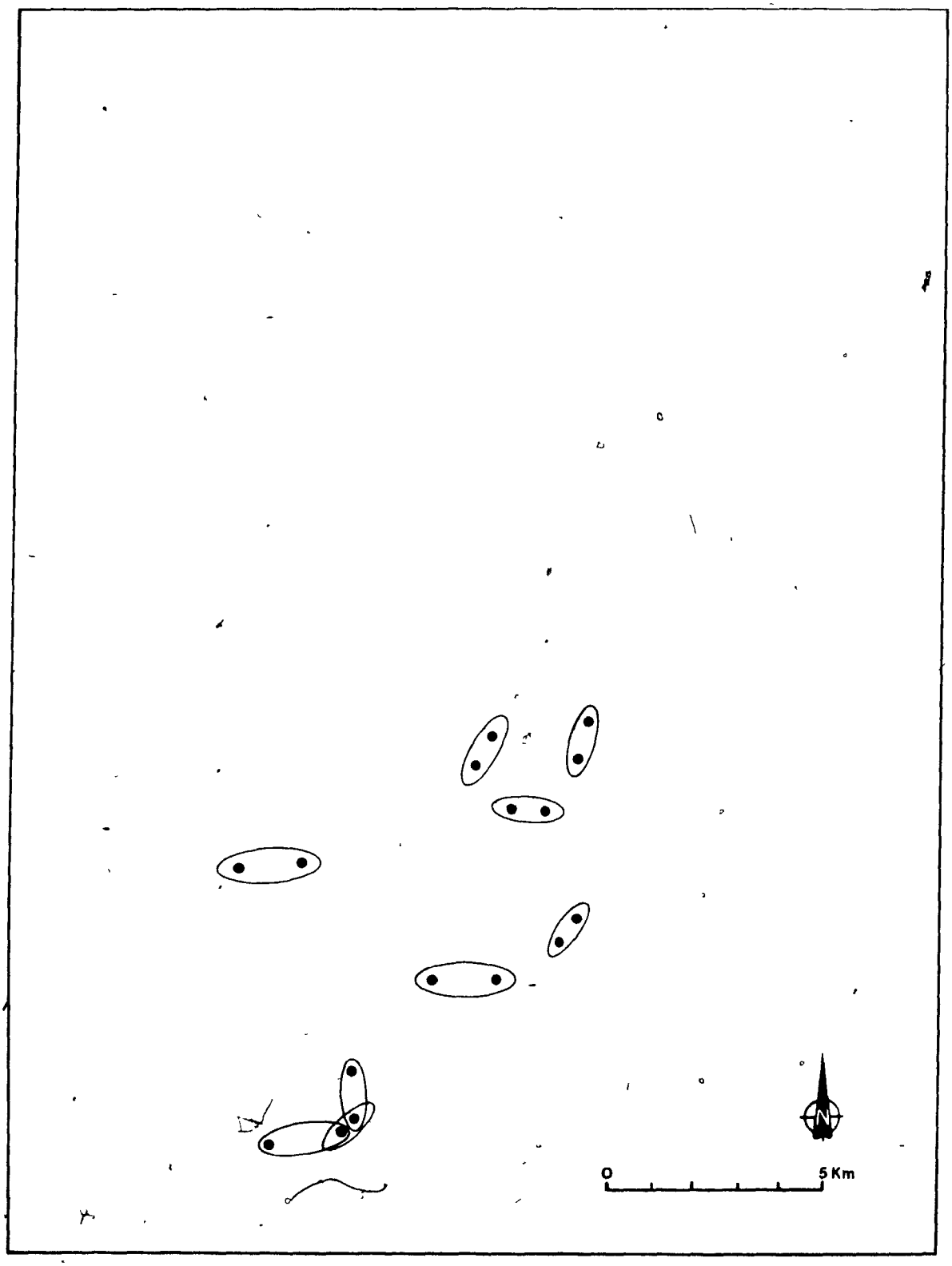
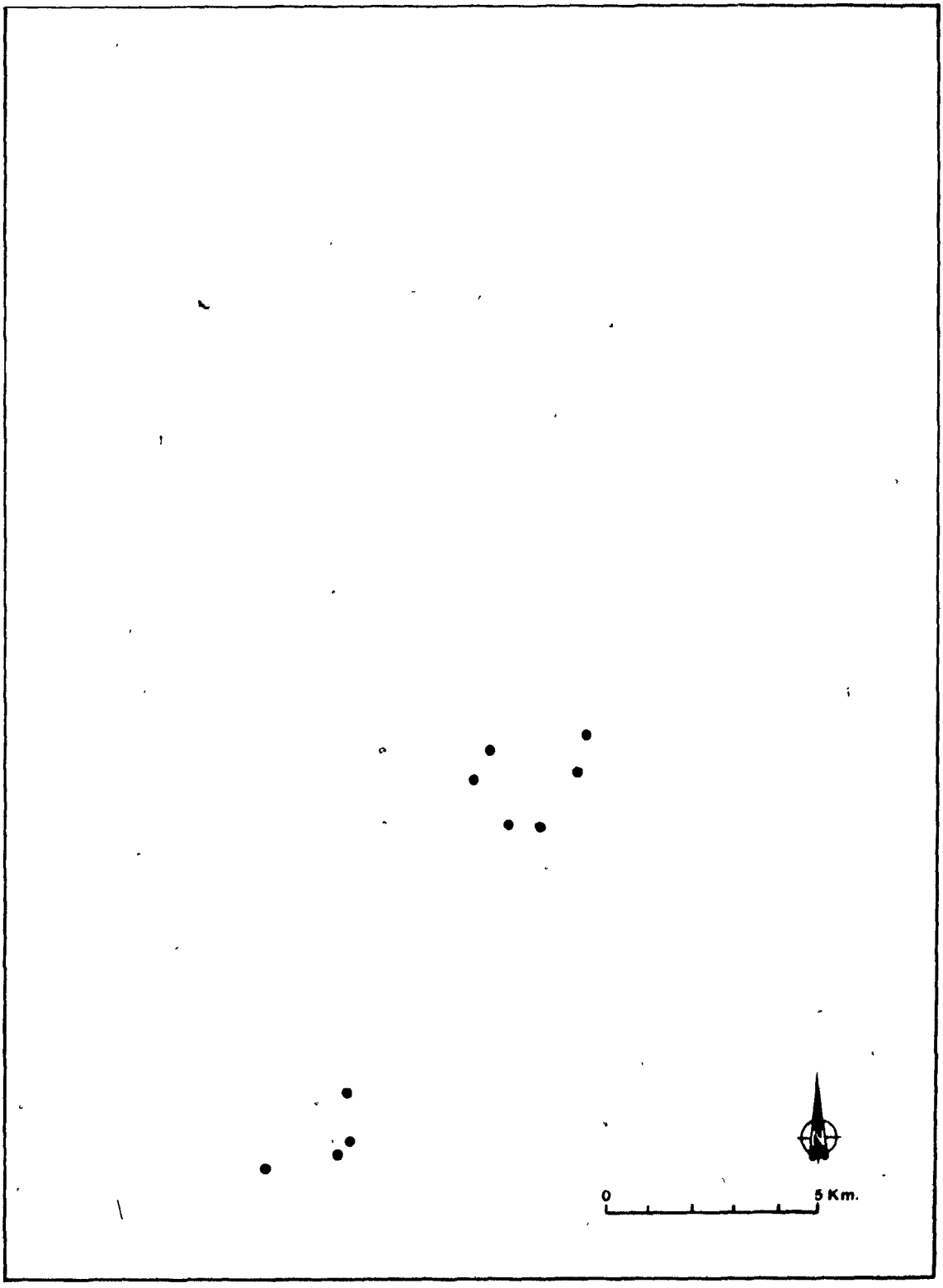


Figure 16: Map of Research Area Showing Site Clusters



Bogle I, Bogle II, and Hood sites, which have been referred to elsewhere as the Beverly cluster (Lennox 1981). The other group consists of the Crawford Lake, Rife, Unick, Van Eden, H&R, and Plunge Pool sites, all located in the Crawford Lake locale.

In order to evaluate the validity of these clusters beyond mere statistical isolation, it is necessary to consider if they are the result of either sampling bias or some purely spatial constraint. It was argued above that the nature and duration of the archaeological survey in the research area indicates a fairly high probability that the known sites are representative of the total site population. This suggests that the clustering identified here is not accidental, or the result of sampling bias. The sites selected for detailed analysis in this study, all tentatively identified as Middleport components, are part of the isolated spatial cluster in the Crawford Lake locale, while the other four sites are not part of any cluster as yet identified. It is important to note that the sites in the Crawford Lake cluster, Crawford Lake, Rife, Unick and Van Eden, are those that were also isolated as a group because of the anomalous distribution of pipe styles. Because of this, we must consider the possibility that the anomaly of pipe styles is attributable to simple spatial separation. Since the distance between these sites in the Crawford Lake cluster and the other four is as little as 4 km. and only as great as 12 km., this is not a reasonable explanation. The deviation from randomness cannot, therefore, be explained in purely formal or spatial terms.

Iroquoian sites that are located close to each other geographically are often assumed to be related to each other in some other way. Most often they are thought to belong to the same community or ethnic group. In its most general form, this can be seen in MacNeish's assumption that

all sites in a particular broad geographic area were members of a nation or tribe, such as Huron or Neutral (e.g. MacNeish 1952). In a more narrowly defined case, spatial relations among sites were studied by Ramsden in his attempt to isolate pottery attributes that were not temporally sensitive. He argued that attributes which were unique to a single spatial cluster of sites were most likely spatial or social in significance (Ramsden 1977). In another specific case, Tuck related degree of spatial propinquity to both temporal and ethnic closeness when he traced the movement of one large and one small community from site to site through time (Tuck 1971).

Obviously, if we are to pursue such lines of explanation, we must start by establishing at least limited control at the temporal level of inference. It was first thought possible that the anomaly of the pipe styles, if not the spatial cluster, could be explained in terms of chronological variation. It was hypothesized that the appearance of trumpet pipes indicated the transition from Middleport to prehistoric Neutral (Finlayson and Smith 1981), and, therefore, that the four sites in the Crawford Lake cluster were simply earlier than the four sites outside of the Crawford Lake locale. A preliminary seriation of the sites based on MacNeish's pottery types, however, negates this hypothesis. An ordered matrix of Robinson-Brainerd coefficients of similarity among the sites, calculated from the the percentages of types shown in Table 4, is displayed in Table 6. It is immediately apparent that the cluster of sites in the Crawford Lake locale is not earlier than the other four sites in terms of this preliminary relative chronology. An attempt to perform the same process of seriation with all eight sites using Emerson's pipe types produced two clusters of sites that are difficult to relate to each other (see Table 7). Our

conclusion must be that we can explain neither the formal anomaly of the pipe styles nor the spatial cluster in the Crawford Lake locale at the temporal level of inference.

We can, however, propose a preliminary spatial-temporal framework for the eight sites with which we are dealing. The discontinuity in pipe styles separates the eight sites into two sets of four. One of these groups also constitutes a geographical cluster in the Crawford Lake locale. Taking both the formal and spatial anomalies together we may assume that the separation is not accidental, and that it has some archaeological validity. The seriation of the sites using MacNeish's pottery types indicates that the two groups are not separate in time, but appear to be more-or-less contemporaneous. For sake of simplicity, the set of sites consisting of Crawford Lake, Rife, Unick and Van Eden is referred to as Group 1, and the set consisting of Chypchar, Campbell, Pipeline and Milton is referred to as Group 2. At this point the ethnic relationships among the sites within each group are not considered. Until we can explain the pronounced anomaly in the pipe styles, however, we cannot assume that the pipe types are strong entities for chronological seriation; the seriation using Emerson's pipe types will, therefore, be ignored for the present.

If we examine the seriated orders for the two groups generated using MacNeish's types, we note that neither of the matrices can be arranged perfectly. This indicates that MacNeish's types may not be the most useful seriation entities for these sites. The ordering of the sites, to determine which were earliest and which latest was decided from an examination of the frequencies of individual pottery types. For example, since the Milton site has the highest percentages of Lawson Incised and Lawson Opposed, types that according to Wright (1966, 85)

are characteristic of Neutral pottery, this site was placed at the latest end of the series. Unick, on the other hand, has the highest percentage of Middleport Oblique, a characteristic Middleport pottery type, indicating it should be placed at the earliest end of the sequence. Our preliminary spatial-temporal framework, based on traditional pottery types is, then, as follows:

	Group 1	Group 2
Earliest	Unick	
	Rife	
		Chypchar
	Crawford Lake	
		Pipeline
	Van Eden	
		Campbell
Latest		Milton

This framework does not, however, account for either the formal or spatial patterns identified above. To deal with these, we must seek other, more complex modes of explanation at higher levels of inference, but using our preliminary cultural-historical model as a foundation.

4.4.3 Economy, Society, and Culture: Evaluation of An Analogy

Inference and assumptions at the levels of economics, social organization, and culture are more complex in formulation and evaluation than those at the levels of space or time. For prehistoric Iroquoian societies a version of ethnographic analogy using the Direct Historic Approach has often been employed in the past. Analogues, for the most part, have come from ethnohistorical sources. Iroquoian groups in

Ontario were contacted by Europeans in the early seventeenth century. French explorers, traders, and missionaries compiled descriptions that have served as invaluable sources of information, especially for the Huron (e.g. Biggar 1929; Wrong 1939; Thwaites 1896-1901). Based on this information, a number of important ethnographic treatises, or historical ethnographies have been written (Tooker 1964; Trigger 1969; 1976; Heidenreich 1971). Both the primary and secondary sources have been used by students of Iroquoian prehistory as a basis for the Direct Historical Approach. The problems and misuse associated with this approach, discussed in Chapter 2, have limited its power. Nevertheless, a number of general assumptions can be drawn from the historical information, if it is kept in mind that they are assumptions, and their relative probabilities should be continuously tested.

The procedure adopted here will be to outline some general characteristics of a particular Iroquoian group, the Huron, that have been documented ethnographically by Trigger (1976), and to extend these characteristics through space and time to the research area of 600 to 700 years ago. The characteristics chosen are general ones that I argue are relevant to the assumptions and inferences that will be proposed in later sections of this dissertation. It is in an application such as this that the Direct Historical Approach as historic analogy must be used with great care. The historical link in this particular case is the assumption that the historic Huron and the groups who occupied our present research area were historically related Iroquoian societies. This link must be qualified from several perspectives. Firstly, as argued by Ramsden (1977) the observations contained in the primary ethnohistorical sources are imperfect. Secondly, the groups about whom these observations were made were not 'pristine' examples of traditional

Iroquoian society, since they had been in indirect and then direct contact for several decades with European traders. Thirdly, it must be recognized that, if we accept the spatial and temporal assumptions discussed above, the historical analogy is drawn across space as well as through time, and this must be taken into account when formulating assumptions for use at the economic, social, and cultural levels of inference. For these reasons, I have chosen, as will become readily apparent, to concentrate on only the most generalized aspects of Iroquoian society as analogues, with the proviso that even these must be carefully evaluated. As an example of the dangers of overdrawing a specific analogy, we can use data on the distribution of Iroquoian pipes in the New York State during late prehistoric times (Kuhn 1986). Kuhn's study suggests, on the basis of an analysis of trace elements, that smoking pipes were traded widely in the Mohawk Valley. Using this information as an analogue, it would be expected that Iroquoian pipes were also widely traded in Ontario during Middle Iroquoian Stage times. The nature of the distribution of the distinctions between pipe styles across southern Ontario discussed above, however, dramatically decreases the probability that such widespread distribution was the case in Ontario at that time. On a more positive note, recent research has provided archaeological data that show a link between prehistoric and historic Iroquoian sites in terms of systematic changes and similarities in aspects such as settlement pattern (e.g. Dodd 1984; Warrick 1984). This allows us to be more confident about generalized analogies.

Economically, the historic Huron were swidden agriculturalists. They relied for subsistence on a combination of resource extraction and resource production, of which the latter was the more important. Faunal resources were obtained almost solely through extraction, that is, from

hunting, trapping, and fishing. The predominant source of floral food, and of the subsistence base in total, came from the cultivation of domesticated plants, primarily maize, beans, and squash. These cultigens were supplemented with collected wild food plants. Of cultigens unrelated to subsistence, only tobacco seems to have been produced in any quantity, but probably not in great amounts by Hurons in Huronia (Trigger 1976).

The major division of labour in Huron society was along sexual lines. Males were responsible for extracting wild faunal resources and, apparently, for clearing fields and cultivating tobacco. One of the more important faunal resources, apart from fish, was deer, which provided meat, bone, and hides (see Gramly 1977). Females were responsible for cultivating the main subsistence cultigens (maize, beans, and squash) and for collecting wild floral resources. While it is evident that these responsibilities cannot be neatly divided along lines of floral versus faunal exploitation, or production versus extraction, the primary subsistence practices can generally be classified as faunal resource extraction by males, and floral resource production by females (Trigger 1976).

The basic economic unit of Huron society was apparently the nuclear family engaged in domestic production and extraction. Nuclear families were grouped to form extended families, the physical manifestation of which was the longhouse. Most longhouse structures appear to have been dwellings, although some may have had specialized purposes such as storage for firewood. An extended family may have functioned as a corporate group, but this is certainly not firmly enough established to serve here as an assumption. The Huron social unit for which economic patterns seem to be best understood by both archaeologists and

historians is the community, which consisted of a group of extended families. There are, however, some problems even at this relatively inclusive level. An important economic question is in what sense were the units discussed above economically self-sufficient. For example, there has been no adequate resolution of the question of economic specialization among the Huron (cf. Warrick 1984, 104-110, discussed below). The assumption that can be made with the strongest probability is that each community was a self-sufficient economic unit.

Huron villages varied in size, but it has been argued that an Iroquoian village always occupied at least 0.2 hectares of area (Noble 1975, 38; Heidenreich 1971, 377). Warrick (1984, 8) states that the minimum size of an Iroquoian village is 0.41 hectares, although he does not say how he arrived at this figure. Both Pearce (1984, 132) and Williamson (1985, 169) argue that 0.5 hectares is the minimum size of an Iroquoian village. The issue of differing site functions and sizes has yet to be systematically resolved, and there appears to be no consensus of opinion on the minimum size for an Iroquoian village. For purposes of this study, I will use the highest estimate of minimum village size listed above, and assume that any site under 0.5 hectares is more likely to be some sort of special purpose station than one that is greater than 0.5 hectares.

A Huron village was not occupied on a permanent basis, for a number of reasons, mostly economic. The Huron practiced what is called swidden, slash and burn, or long-fallow cultivation (Boserup 1965). This involved clearing a plot of land by cutting underbrush and girdling large trees, burning the residue, and then planting crops for several years until the soil nutrients were depleted. This plot was then, apparently, permanently abandoned. The cycle was repeated on other

sections of land over a number of years until all of the arable soils within a reasonable distance of the village were exhausted, and other resources, such as firewood, were depleted. This depletion of local resources was one important factor in a community's decision to relocate its village in a new area where the cycle could once again run its course. The length of time that a single village site was occupied has been estimated at between 10 and 30 years, depending on local conditions (Heidenreich 1971). It is assumed that availability of resources, in combination with other factors, such as convenience of relocation, would have been a consideration in the choice of subsequent village locations.

Little information about social organization is available from the primary sources. The scanty evidence is complete enough, however, to make some general observations. As well as being economically self-sufficient, a Huron community was also, apparently, relatively autonomous socially. Even though the historical Huron were organized into tribes and then in turn into a loose confederacy, the most important social units were the clan segment and the village community. Although the details of Huron social organization are not well understood, the following general patterns seem to be characteristic.

A community consisted of at least one, and sometimes several, clan segments, each made up of a number of extended families. Each clan segment had two nominal leaders or 'headmen', neither of whom had any coercive powers. One of these headmen was a civil leader, who managed the internal affairs of the clan segment, while the other was a 'war' leader, who coordinated its military affairs Clan segments associated themselves with each other within a village community in cooperative manner and at will. Trigger notes that "The physical capacity to opt

out of larger units allowed each clan segment to retain a maximum amount of autonomy" (1976, 56).

The affairs of an entire village community were handled by a council consisting of the civil leaders of the clan segments, one of whom was a spokesman without coercive power. This council was responsible for coordinating public activities for ceremonial and other purposes, mediating legal disputes, and managing relations with other communities. The members of this council also appear to have been the members of the successively more inclusive tribal and confederacy councils. The most influential of these councils, however, was at the village level, and each village community remained socially autonomous. In other words, most village communities were not subsidiaries of other communities. According to Trigger, "The daily face-to-face interaction of villages generated a concern for one another that did not exist at higher levels of Huron political organization" (1976, 56).

As noted above, the Huron did not rely on ascribed coercive powers to maintain social stability. Instead, they depended on cooperative interaction that emphasized social integration. The key to this cooperation was the exchange of material goods through gift-giving among community members and trade with other communities. Although this redistribution of commodities had obvious and important economic ramifications, reciprocity seems to have been at least as important as a means of reinforcing social integration. For example, much of Huron legal mediation consisted of arranging for resolution of conflict through presentation of material items as gifts, even for murder (Trigger 1976, 59-62).

It is important to note that division between the sexes evident at the economic level was carried into Huron social relations. Although

women appear to have had significant influence within families, clan segments, and communities, the councils consisted of men only. Relationships outside of the community, such as trade and warfare, were handled by men.

It is evident from the above description that both economic self-sufficiency and social autonomy were characteristic of the Huron. Counter balancing this independence was the Huron concern with integration. These concerns were reflected in their cultural symbolism. For example, the mortuary practices of the Huron emphasized the relationships among individuals, families, and communities. The major funeral ceremony, called the Feast of the Dead (see Tooker 1964, 128-143), which involved the interment of the dead of one or several neighbouring communities in a common grave, was a symbolic expression of both social autonomy and integration (Trigger 1976, 87; Smith 1979).

This pattern can be seen in other cultural practices, such as the use of tobacco. This plant was employed by the Huron to express various relationships. Tobacco was offered in some ceremonies and burnt in others to effect a relationship with the supernatural (Tooker 1964, 80). Tobacco could be, and often was, employed to symbolize social relationships among people. For example:

> The Indians [the Huron] never spoke of business nor came to any conclusion without having a pipe in their mouths ... (Tooker 1964, 50).
> When the Indians wished to entertain someone and demonstrate their friendship for him, they presented him with a lighted pipe after having smoked it themselves (Tooker 1964, 57).

The nature of smoking in Iroquoian society as documented by Europeans in contact with the Huron has been examined in some detail by von Gernet (1985). He notes that smoking appeared to be ubiquitous among the Huron, but also that it appeared to have a number of social contexts:

> ... the Jesuits observed that pipe smoking facilitated socializing (Thwaites 27: 249; 58:187-9; 59: 119) and served to demonstrate solidarity between friends (Thwaites 27: 301; 40: 207; Wrong 1939: 88). During meetings, pipe smoking took the place of conversation (Thwaites 26: 161), "appeased the passions" (Thwaites 10: 219), and enabled them to "see clearly through the most intricate matters" (Thwaites 10: 219); 15: 27). ... Pipes were also used at meetings (Biggar 1925: 283, 284); 1929: 182, 183; Wrong 1939: 150), councils (Thwaites 10: 219; 28: 295; 38: 253), during "talks, treaties, welcomes and endearments" (Thwaites 3: 117), and at festivals during which "nothing is consumed except tobacco in pipes" (Wrong 1939: 119) (von Gernet 1985, 161-162).

There seems to be difference between the use of tobacco in a ceremonial context as a mediator between humanity and the supernatural, when it was thrown into water or burnt in a fire, and the more secular use of tobacco in pipes for smoking. Because of this, it is unlikely that the styles of pipes would have a ritual significance (cf. Mathews 1978, 161). The smoking pipe is, therefore, an important artifact that may be symbolic of social relationships. There is little in the ethnographic record, however, that clarifies the nature of such possible symbolism.

We have, in this section, explored some pertinent general economic, social, and cultural characteristics of the Huron. Although a detailed consideration of the application of these traits as analogues for the Iroquoian societies in our present research area will be reserved for the next chapter, we can briefly consider the suitability of analogy with the Huron. As noted at the beginning of this section, we are employing, as a method for historical analogy, the Direct Historical Approach, and drawing it across both space and time. In terms of space the analogy is supported by the location of the research area within the confines of the region occupied by Iroquoian peoples during both historic and prehistoric times (Wright 1966). As pointed out by Trigger, many of the general characteristics of the Huron also apply to

the other Iroquoian groups in northeastern North America (1976, 99-104). These general patterns include the economic self-sufficiency, social autonomy, and concern for symbols of integration that have been discussed above. In terms of time we are on less sure ground. Generally, however, the strength of this form of analogy is its historical link, allowing us to assume that, unless we see evidence to indicate otherwise, general patterns will remain valid. In this case, we must deal with the influences of the formation of the Iroquoian confederacies and of the European invasion. On the one hand, both of these were relatively recent events at the time when the French recorded the observations outlined above. On the other hand, both of these factors may have served, and in some cases obviously did serve, to decrease economic self-sufficiency and social autonomy. In other words, I argue for a high probability that the characteristics I have emphasized for the Huron were representative of Iroquoian groups in the present research area, and that they may have even been more pronounced. It remains to integrate these characteristics into a model that explains the formal anomalies identified in previous sections, and that can be tested using analytical entities.

4.5 Summary and Discussion

In the sections above, we have examined the physical (empirical) entities of both the natural and archaeological contexts of the research area. We examined, in addition, a number of vital assumptions that are associated with such entities for the purpose of establishing a basis for the formulation of a theoretical model that can be tested using analytical entities. In this concluding section, this model will be proposed and its ramifications for analytical entities briefly

examined.

Much of the discussion above centred around the identification of several anomalies or patterns that appear to be manifested at the level of form. These include the environmental distinctiveness of the research area and especially the Crawford Lake locale, the spatial clustering that appears to characterize the sites in the Crawford Lake locale, and the distinctiveness of pipe styles that distinguishes the sites in the Crawford Lake locale from those in the surrounding area. The model proposed here links these patterns of variation to each other by appealing to assumptions presented above within the organizing framework of levels of inference.

In terms of space and time, we have already constructed a preliminary framework of culture-history. This framework proposes that the sites in the spatial cluster termed Group 1 were roughly contemporaneous with the sites in Group 2. It is obvious that both the spatial and temporal relationships of these sites must be both confirmed and refined. We must attempt, for example, to discover if there are any other formal patterns associated with the spatial clustering of sites, and to produce a more fine-grained chronology for these sites. With our analogue in mind, however, we can now proceed beyond this simple, but vital, spatial-temporal context.

If the sites in the research area are analogous to Huron villages we can propose that we are dealing with a set of economically self-sufficient communities. Since each of these sites is at least one-half hectare in extent, they are large enough to qualify as villages by the criterion of site size argued by Pearce (1984) and Williamson (1985). By analogy, these villages were occupied by swidden horticulturalists who moved their sites every 10 to 30 years. The sites in the research

area, therefore, probably represent the subsequent locations of at least one community moving its village site location through space and over time. Because of the formal anomaly of pipe styles and the coincident anomaly of spatial clustering, I propose that the sites in Group 1 represent the village locations of a single community that chose to circumscribe the area within which it relocated. The Group 2 sites represent the successive village locations of another community that did not choose to limit its movement as rigorously. We can now begin to consider the anomalous patterns we have previously identified in terms of the relationships between these two communities.

I propose that the reasons the Group 1 community chose to remain in the Crawford Lake locale were economic ones. In section 4.2 we considered the environmental distinctiveness of the area immediately around Crawford Lake. Considered from the viewpoint of Iroquoian subsistence practices, this locale has the most optimal environmental situation in the research area. This would have been especially true in the context of an episode of deteriorating climatic conditions. The Group 1 community, if in economic control of the Crawford Lake locale, would have been able to sustain some advantage in comparison to the Group 2 community. Such a situation of economic competition would have had significant effects on the social relations between the two communities.

The coefficients of similarity among sites for MacNeish's pottery types presented in Table 6 indicate, at least in a preliminary sense, that there was no considerable social distance between the two communities. For example, the highest coefficient in Table 6 is that between Pipeline and Van Eden (184.23), sites interpreted as belonging to separate groups. In addition, Figure 4 shows that the spatial

distance between the sites of the two communities is not great enough to postulate that they were socially isolated. We can infer, therefore, that there must have been some considerable degree of interaction, such as trade and/or ceremony, between the two communities. The analogue of Huron communities allows us to infer that these two communities were socially autonomous, and that any formal social relations between them would more likely have fallen into the men's domain. In addition, we can infer that these relationships may have been symbolized in some fashion.

By appealing once more to the Huron analogue, we can infer that the social relationships between the two communities may have been expressed in the male use of tobacco. This leads us directly to the anomaly in pipe styles between Group 1 and Group 2. I propose that the pipes were employed by the men of the two communities during the course of any social interaction between the two groups in situations where the distinctiveness of the two would have been emphasized (for example, if the men of the two groups were negotiating access to resources in the Crawford Lake locale. Following the arguments of Wobst (1977), I infer that the differences in the pipe styles can be explained as a symbolic means of expressing the autonomy of the communities and the economic competition that existed between them.

We have, in this section, constructed a model that attempts to explain the formal anomalies that were recognized in the preliminary examination of our empirical data. This model was constructed within the framework of levels of inference by appealing to both archaeological models of culture-history and to historical analogy. The point of the analogy in this case was not to look for external examples of specific details of Iroquoian life, but to attempt to recognize general patterns.

It now remains to evaluate this model through a detailed examination of analytical entities to ensure that the model does not violate the archaeological integrity of our data. This will be attempted in the following chapter. It is clear from the above that the model revolves around the question of the social relations between the two communities. Because of this, one of the major problems to be addressed in the following chapters is the nature of these relations as they are revealed in analytical patterns of ceramic artifacts.

CHAPTER 5.0

Examination of Analytical Entities

5.1 Introduction

This chapter is devoted to a systematic examination of the analytical entities selected for detailed study. This discussion is divided into two parts. The first part (Section 5.2) presents a description of the analytical entities employed and the rationale behind their selection. The second part (Section 5.3) describes the process of identifying significant variation in terms of essential and key variables defined in the context of levels of inference. The purpose of this discussion is to provide the analytical basis for evaluation of the model presented in the previous chapter. This evaluation will be conducted in the final chapter of the dissertation.

5.2 Selection and Recording of Analytical Entities

The process of selection of analytical entities may be broken down into two interrelated parts: (1) designation of variables; and (2) designation of values or alternatives for each variable. The identification of variables and values from Iroquoian ceramics has been the subject of much discussion and experimentation (e.g. Wintemberg 1931; MacNeish 1952; Ramsden 1977). The experience of other researchers is of great benefit to the present task of selection. Although, as noted by Clarke (1968, 152), there are an infinite number of variables that can be identified from any set of physical entities, a limited number of variables have been isolated and considered with some measure of agreement and success by Iroquoian researchers. On the other hand, the task is made more difficult by the relative lack of agreement that has surrounded the identification and use of values of these variables.

Although I attempted to define some new variables (with limited success, as noted below), I have confined the present study, for the most part, to the traditional list of variables, and concentrated on a more systematic examination of the values associated with them.

The present study has also been aided by recent improvements in aspects of recording and processing data. As was noted in Chapter 2, there has been a trend toward increasing refinement of the quantitative handling of archaeological data. This has included computer processing of data, and the design of systematic data formats amenable to such processing. The systematic formats used to handle ceramic data (from both rim and bowl sections) in this study are a direct reflection of the selection of variables and values. This selection will be discussed in some detail here.

There are a number of different kinds of variables that have been employed by researchers to classify archaeological data, most commonly variables with nominal, ordinal, or interval scales. A lucid and concise discussion of these kinds of variables has been written by Albert Spaulding (1982, 1-5). As he makes clear, the difference between one kind of variable and another is determined by the relationships among the values of the variables. In a strictly nominal variable the values are simply different and exclusive from one another other (e.g. the values 'green' and 'red' in the nominal variable 'colour'). No attempt is made to measure the degree of difference among them. In a variable with an ordinal scale, the values are set in serial order according to some criteria (e.g. the values 'small', 'medium', and 'large' in the ordinal variable 'size'), but the degree of difference is not specified. In a variable at the interval level the differences

among the values are defined precisely and systematically against some continuous scale of measurement (e.g. the interval variable 'length' can be measured in centimetres). The difference among these kinds of variables is based, therefore, on increasing levels of emergent information. Because of this, Spaulding explained:

> A plain aspect of the comparison of different kinds of scales is an appreciation of their increasing power to define structure as we proceed from the humble nominal scale through ordinal, simple interval, and ratio interval scales. This increasing power implies that the range of mathematical operations legitimately applicable also increases (Spaulding 1982, 4-5).

Spaulding argues, however, that generally in the course of examining the relations among the values of different variables (multivariate analysis), nominal variables tend to become a sort of 'lowest common denominator', since different level variables cannot be compared to each other. Higher level variables can be redefined as lower level variables, but the reverse is not true. During the course of the present study all three - nominal, ordinal, and interval - scale variables were used to record data. When dealing with individual variables some attempt was made to exploit the advantages of the higher level scales. The examination of multivariate patterns, that is, investigating the correlation of the values of two or more variables, however, necessitated the translation of interval and ordinal values to nominal values if one of the variables was nominal in scale.

Harkening back to Wintemberg (1931, 83); we may propose that there are two categories of variables pertaining to ceramic artifacts: variables of shape and variables of decoration. These apply to both rim and bowl sections. Traditionally, the identification of variables of shape have been relatively straightforward. According to Marois (1984),

however, variables of decoration have been more controversial. I will here deal with both classes of variables, but will concentrate on a systematic approach to the identification of variables of ceramic decoration.

The systematic format used in this study to record observations of attribute variables and values from the rim and bowl sections are referred to as the rim and bowl section data codes. The rim section code is an adaptation of one developed by Ramsden to process rim sherd data for his Ph.D. dissertation (Ramsden 1977). A variant of this data code was used at the Museum of Indian Archaeology to process the rim sherd data from the Draper site (see Pearce 1978), and by myself for the rim sherd data employed in my M.A. research (Smith 1983). The bowl section code is an adaptation of the rim section code applied to ceramic pipes.

The list of variables and their associated values for both of these codes is presented in Appendix A. An examination of these variables and values follows.

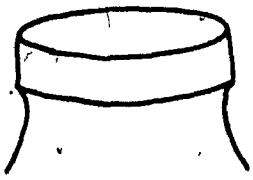
5.2.1 Analytical Variables and Values for Rim Sections

Variables of Rim Shape

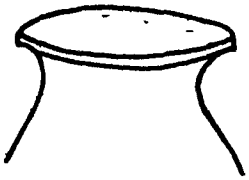
Rim Form

The values of this nominal variable designate the shape of the upper rim portion of the rim section.

Collarless



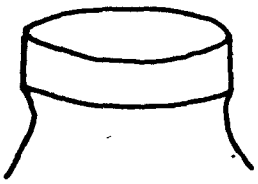
Collared



Everted Lip

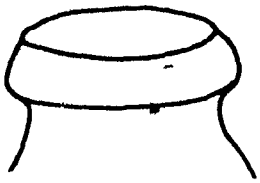
Rim Orientation

The values of this nominal variable refer to the orientation of the rim relative to the rest of the vessel. Because this study deals with rim sections and not fully reconstructed vessels, the values of this variable were often not observable.



Vertical

Outflaring



Insloping

Exterior and Interior Profiles

The values of these nominal variables refer to the shape of the exterior and interior of the rim section, respectively, when viewed in profile.

<---- Exterior

Straight

Convex

Concave

Interior ---->

Straight

Convex

Concave

Angle of Lip to Interior

The values of this nominal variable are intended to provide a measure of the orientation of the lip of the rim section to the rest of the vessel.

Acute

Right

Obtuse

Collar Base Shape

The values of this nominal variable refer to how pronounced the collar is with reference to the rest of the vessel when a collar is present.

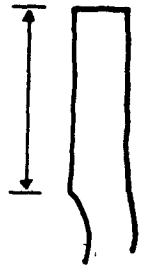
Poorly Developed

Well Developed

Highly Developed

Collar Height, Lip Width and Collar Base Width

The values of these variables are all measurements on interval scales. Collar height and collar base width were measured on collared rim sections only. Lip thickness was measured on all rim sections where the full lip was intact. Collar base width could be measured only where the interior of the rim section was intact.



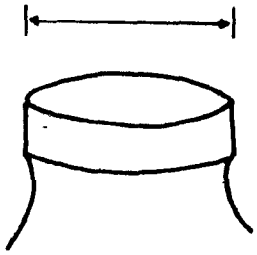
Collar Height

Lip Thickness

Collar Base Thickness

Rim Diameter at the Lip

This variable also consists of measurements on an interval scale. The method of measurement was to compare the arc of the lip of a rim section to the arc of a circle of known diameter. For this measurement to be accurate the surviving rim section of the vessel had to be large enough for the comparison to be performed. This was the case in only about half of the rim sections.



Variables of Rim Decoration

In Chapter 2.0, Marois' (1984) contribution to the clarification of terms and concepts relating to prehistoric ceramic decoration was discussed and criticized. In this section I propose a compromise between Marois' suggestions and more traditional approaches. It may be useful to introduce my arguments by restating two important concepts that have already been discussed in this dissertation:

(1) Binford's admonition that the archaeological record is static

and contemporary; and

(2) the distinction between physical and analytical entities.

In his discussion of decorative elements, Marois states that "Our research community acknowledges, implicitly in any case, that prehistoric pottery decoration entails both implements and motions" (1984, 139). If we subscribe to Binford's statement, however, decoration of ceramic artifacts (or any other class of artifact) does not entail implements or motions in an archaeological context, since ceramic vessels and pipes are part of the static, contemporary archaeological record. Neither tool (in the sense of an object in use) nor motion can be observed directly, but must be inferred. In the physical realm, ceramic decoration is, generally and simply, marks on the surface of a vessel or a pipe.

Marois makes the distinction between production elements and constituent elements. These, as I interpret them, refer to aspects of the individual elements and their relationships to each other in what Marois calls aggregates or arrangements. Since these terms are rather clumsy, let us use Marois' concepts to redefine traditional terms. As implied above, what is observed on the surface of artifacts are individual marks or alterations, and arrangements or aggregates of these alterations. In the transformation from physical entities to analytical entities, the individual marks or alterations can be classed within a variable according to their nature as elements, and the arrangements of these elements can be classed within a variable as motifs. We have, then, two analytical variables of decoration, element and motif.

Often associated with decorative element, and confused with it, are 'technique' and 'tool'. I have defined a decorative element as an

observed individual mark or alteration on the surface of a vessel. A decorative technique is the action that produced a decorative element, and a decorative tool is the implement with which the technique was performed. Technique and tool, however, cannot be observed in a static, contemporary element, and must be inferred from various characteristics of the element. Initially in this study an attempt was made to infer the nature of both tool and technique of decoration. This effort was terminated for two reasons. Firstly, observation of the relevant characteristics of a decorative element involved a minute and time-consuming process of examining traits often visible only under high magnification. Secondly, and more importantly, accurate interpretation of these characteristics would have involved a specialized undertaking involving intensive experimental analogy that I considered beyond the scope of this dissertation. Inference of technique and tool was, therefore, considered unreliable in this study, and not carried through.

The values chosen for the variable of decorative element (listed in Appendix A) are variants of those selected and employed by other researchers, but usually referred to under the variable 'technique'. For example, the element that is often used to infer either a 'trailing' or 'incising' motion is here called a furrow; no attempt was made to distinguish between the two motions. Double-furrow refers to the element associated with a 'push-pull' motion. The various 'stamp' elements are distinguished by specific traits. Linear stamp element consists of a continuous linear impression. Spiral stamp refers to the element commonly used to infer a cord-wrapped tool. Decorative element was treated as a strictly nominal variable.

The selection of values for the variable of decorative motif was the most difficult and time-consuming task of the value selection

process, and perhaps of the entire study. Instead of simply assigning sequential designations as motifs were recognized as has been done in the past (Pearce 1978) or pursuing certain permutations of constituent elements in an attempt to infer "prehistoric potters' perception of the ways of configuring the surfaces of pottery vessels" (Marois 1984, see also Latta 1980), I endeavoured to produce a logical taxonomy of decorative motifs. This taxonomy includes five levels of classification, ranging from highly inclusive to highly exclusive. As a comparative framework, I used the analogy of biological taxonomy. The five levels may be compared to order, family, genus, species, and subspecies or variety. At the level of order, I conceived of seven general categories. These basic categories were arranged from least to most complex as follows: Plain, Simple, Superimposed, Horizontal Difference, Vertical Positioning, and Vertical Difference. Further, more complex categories were generated by permuting the basic seven listed above. Except for Plain, each of these seven general 'orders' was subdivided into a number of 'families'. The Simple order, for example, was divided into Linear, Curvilinear, and Punctate, based on the observed alternative elements that occur as decoration on Iroquoian ceramics. Each 'family' was then divided into a number of 'genera'. The Linear family, for example, consists of Non-horizontal, Horizontal and Linear Dash motifs. Continuing the process, each genus was divided into species, and each species into subspecies or varieties. As an example, the Non-horizontal genus was divided into Vertical, Oblique Right and Oblique Left species, and each of these species was subdivided into an array of varieties.

In an attempt to render the labeling of the motifs at all levels

consistent and more concise, a three tiered system of reference consisting of full names, short form mnemonics, and single letter codes was devised using the following conventions of contraction and symbols. Names of orders, families, genera, and species are initially spelled out in full, as is the case in the paragraph above. These names are then shortened by selecting three letters from each name and capitalizing them. For example, Simple is contracted to SIM; Non-horizontal is contracted to NHO. In the text, the full name and short-form of a label is supplied when it is first encountered. Thereafter the short-form is used. In this way, any simple motif can be designated by a single three letter mnemonic in the four most inclusive levels of the taxonomy. This system greatly reduces the space and effort required for labeling motifs. For example, Punctate Elliptical Non-horizontal is referred to simply as 'PEN'. Varieties were not provided with mnemonics because they were so numerous that giving each such a code would defeat the purpose (i.e. conciseness) of the system of reference.

Since complex motifs consist of combinations of simple motifs, it was decided to refer to the complex ones by designating their constituent simple motifs and symbolizing the relationship between or among them. The symbols for these relationships are as follows:

Superimposition: 'x' (e.g. NHO X HOR)

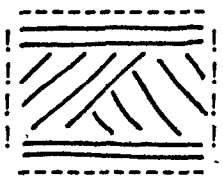
Horizontal Difference (Interrupted): '-' (e.g. LIN - LIN)

Horizontal Difference (Opposed): '/' (e.g. NHO / NHO)

Horizontal Difference (Combined): '!' (e.g. OBR ! HOR)

Vertical Difference: '>' (e.g. NHO > HOR)

For example, let us consider the relatively complex motif depicted below.



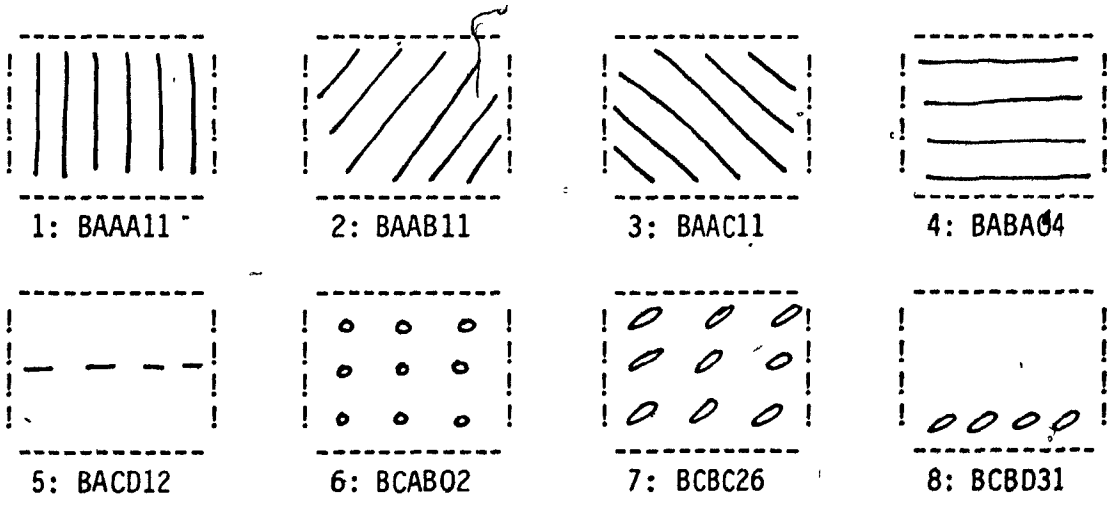
This motif may be described as consisting of three bands of simple motifs. The top band consists of two horizontal lines, the middle one of oblique lines that change direction, and the bottom one of two more horizontal lines. Employing the reference system described above, it would be labelled SIM > HOI > SIM at the level of order, LIN > LIN / LIN > LIN at the level of family, HOR > NHO / NHO > HOR at the genus level, or HOE > OBR / OBL > HOR at the species level.

Finally, since even the short-forms and symbols comprise a label too long to efficiently use with a computerized data base management system (or a manual one for that matter), each of the classes, from order to subspecies, was given a symbolic designation. The first four classes were assigned single character alphanumeric sets of symbols, while the varieties were assigned two character numeric designations. These symbolic designations could then be used as a means of classifying motifs. For example, in the motif label 'EGBD11', 'E' is the order designation (Vertical Positioning), 'G' refers to the family (Punctate over Plain), 'B' refers to the genus (Punctate Elliptical over Plain), 'D' refers to the species (Punctate Elliptical Horizontal over Plain), and '11' refers to a particular variety among a large number of alternatives. If this system was applied to the more familiar biological taxonomy for hominid classification, the following would result:

ORDER	FAMILY	GENUS	SPECIES	VARIETY
A. Primates	A. Hominidae	A. Australo-pithecus	A. afarensis B. africanus C. robustus D. boisei	
		B. Homo	A. habilis B. erectus C. sapiens	01 neander-thalensis 02 sapiens

The complete letter designation of Homo sapiens sapiens is, in this example, 'AABC02'. All of the mnemonics and code letters for motifs encountered in this study are listed in Appendix B.

In order to demonstrate how this classificatory system operates, let us consider some substantive examples. Beginning at the most inclusive level, Motifs 1 to 8 are classified in the Simple order (SIM; B). (In the following discussion, the mnemonic and letter that designate each class are indicated in parentheses following the class name when it is first encountered.) A SIM motif may be defined as one that consists of a single repeated element. Variation occurs with different arrangements of the single element.



At the level of family, Motifs 1 through 5 are classed as Linear (LIN;

A), while Motifs 6 through 8 are classed as Punctate (PUN; C). The genera of the Linear family illustrated above are Non-horizontal (NHO; A) illustrated by Motif 1 to 3, Horizontal (HOR; B) illustrated by Motif 4, and Linear Dash (LDA; C) illustrated by Motif 5. Motif 6 is an example of the Circular (PUC; A) genus of the Punctate family, while Motifs 7 and 8 are of the Elliptical (PUE; B) genus. When we consider species, the Non-horizontal genus is comprised of Vertical (VTL; A) illustrated by Motif 1, Oblique Right (OBR; B) illustrated by Motif 2, and Oblique Left (OBL; C), illustrated by Motif 3. The Horizontal genus was divided into Horizontal Even (HOE; A) and Horizontal Random (HRA; B) species, the former of which is illustrated in Motif 4. The species of the Linear Dash genus illustrated by Motif 5 is Linear Dash Horizontal (LDH; D); other species are Linear Dash Random (LDR; A), Linear Dash Even (LDE; B), and Linear Dash Non-horizontal (LDN; C). Both the Circular Punctate and Elliptical Punctate genera are subdivided into Random (PCR, PER; A), Even (PCE, PEE; B), Non-horizontal (PCN, PEN; C), and Horizontal (PCH, PEH; D) species. Motif 6 illustrates the PCE species, Motif 7 the PEN species, and Motif 8 the PEH species. Finally, the most exclusive level is that of subspecies or variety. The varieties identify minor variations on the motifs provided by the more inclusive levels, and were given numeric designations from 1 to 99. The criteria for designating varieties generally depend on the genus being considered. For example, the varieties of Non-horizontal motifs are determined by the relation of the elements to the space they occupy. If the elements of such a motif on the collar of a rim section simply extend from the top to the bottom of the collar, as in Motifs 1 and 2, then the variety designation is '11'. Taking into account all of the levels, the full classification for Motif 1 is, therefore, 'BAAA11', and

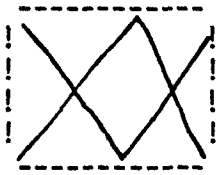
'BAAB11' for Motif 2. If the elements extend below the collar to a minor extent, as indicated in Motif 3, the variety designation is '12', making the full designation 'BAAC12'. The variety designation for Horizontal motifs is determined by the number of horizontal elements in the motif. Since Motif 4 consists of four evenly spaced horizontal lines, its full designation is 'BABA04'. The determining factors for isolating varieties of any of the Linear Dash species are arrangement of elements and number of elements. Motif 5 consists of two evenly spaced rows of dashes, making its full designation 'BACD12'. For the Circular Punctate genus, the guiding factors are arrangement and number of elements. For those motifs that fall into the Even species, it is primarily the number of elements that determines the variety. Motif 6, which consists of two tiers of evenly spaced circular punctates, has a full designation of 'BCAB02'. The factors for the Elliptical Punctate genus are orientation of elements, arrangement of elements and number of elements. For Motif 7, which consists of columns of right oblique elliptical punctates, the full designation is 'BCBC26'. Motif 8 features one row of left oblique elliptical punctates, making its full designation 'BCBD31'.

In addition to the factors for determining varieties described above, some variety designations are reserved for truncated motifs. In this study, these apply to only interior, lip and neck decoration of pottery when parts of these areas of a sherd are fragmentary, and to pipe bowl decoration when not all of the bowl is present. For SIM motifs not involving horizontal components the reserved variety numbers are 1 - 10; for those involving horizontal components the reserved number are 90 - 99. For example, the most common case where such a

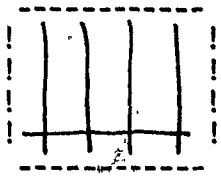
situation arose in the present study was with horizontal lines on the neck of the rim section. When sherds were broken at the bottom in such a way that the total number of elements could not be counted, the motif was designated as 'BABA92'.

After having examined thousands of ceramic artifacts from various Middleport, Neutral, Huron, and St. Lawrence Iroquoian sites across Ontario, it became clear to this researcher that almost all of Iroquoian pottery and the greater part of pipe decoration consists of varieties of simple motifs or combinations of them at various levels of complexity. Accordingly, the higher levels of motif classification were formulated in terms of successively more complex combinations of the SIM motifs. The first level of complexity defined consists of motifs characterized by elements applied over top of each other. This constitutes the Superimposed order (SID; C). The relationship of superimposition is symbolized by 'x'. In this study no attempt was made to determine which motif was superimposed on which (i.e. the order of application) because it was found that the relation of one motif to another was not always clear except when examined under high magnification, a very time consuming process. Studies of the order of application of motifs have been conducted by other researchers (e.g. Latta 1980), and may yield important information.

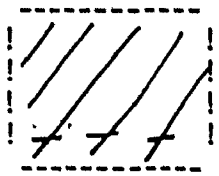
All of the SID motifs encountered in the present study consisted of LIN x LIN motifs (A) at the family level. Examples are illustrated in Motifs 9 to 11.



9: CAAC11.



10: CABA31



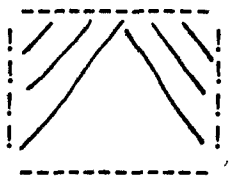
11: CACH31

The simplest form of superimposition involves two motifs of the same genus, such as NHO x NHO (A). The species designation for any SID motif is determined by the permutations of the individual SIM motifs that can be identified in the SID motif. In Motif 9 we see an example of OBR x OBL (C). Other possible species are VTL x OBR (A) and VTL x OBL (B). Varieties are determined in these species by the number of times one element crosses another. In Motif 9, for example, one element crosses another element only once (variety 11). The full designation of this motif is 'CAAC11'. More complex forms of superimposition occur when motifs from different genera are superimposed. For example, Motifs 10 and 11 illustrate NHO x HOR (B) and NHO x LDA (C) respectively. At the species level, Motif 10 consists of VTL x HOE (A) and Motif 11 consists of OBR x LDH (H). The varieties of these more complex species are determined by a combination of the factors that apply for the individual simple motifs of which they are comprised. For example, the variety designation for Motif 10 depends both on the relationship of the elements to the space they occupy (as per simple NHO motifs) and on the number of horizontal lines (as per simple HOR motifs). Since the NHO component does not extend beyond the limits and the single HOR element is located closer to the bottom of the motif than the top the designation is 'CABA31'. Using generally the same criteria Motif 11 is classified as 'CACH31'.

The next level of complexity is that of the order Horizontal

Difference (HDI; D). Motifs in this order are characterized by lateral variation of the elements. In effect, this lateral variation consists of any number of less complex motifs being placed side by side. Three increasingly more complex stages of horizontal difference were conceived of at the family level: Interrupted; Opposed; and Combined. Interrupted motifs consist of SIM motifs of the same genus separated laterally by a gap, and are in effect, combinations of SIM motifs with Plain. Interrupted motifs encountered in this study are limited to the LIN - LIN family, and to the NHO - NHO genus. Interrupted relationships between motifs are symbolized by '-'. Examples are illustrated in Motifs 12 and 13.

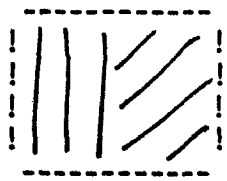
12



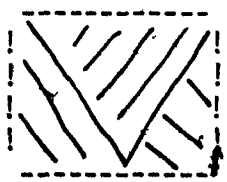
13

Motif 12 falls into the OBR - OBR species, while Motif 13 is of the OBR - OBL species. Factors determining varieties are the same as for the constituent SIM motifs.

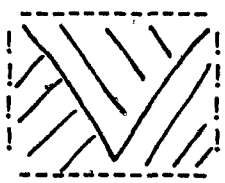
HDI motifs of the opposed category include lateral combinations of SIM motifs of the same genus but, because there are no gaps, the interrelations of the motifs (symbolized by '/') are more complex. In this study opposed motifs of only the LIN / LIN family and NHO / NHO genus were encountered. Examples are illustrated in Motifs 14 to 17.



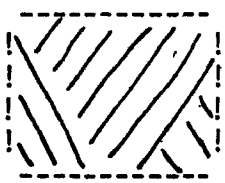
14



15



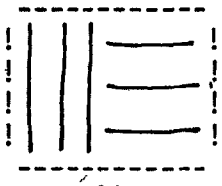
16



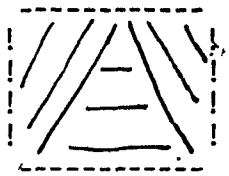
17

The species of opposed motifs in the NHO / NHO genus are determined by the various combinations of VTL, OBR and OBL motifs. For example, Motif 14 depicts a VTL / OBR combination, while Motifs 15 to 17 depict OBR / OBL combinations. The varieties are determined by the same factors as those for the constituent NHO motifs, but also by the relationships between them. For example, in Motif 15 the OBR component forms triangles that open toward the top of the motif, and the OBL forms triangles that open toward the bottom (variety 11). In Motif 16, the relationships are reversed (variety 12). Motif 17 shows the constituents forming rhomboids instead of triangles (variety 21).

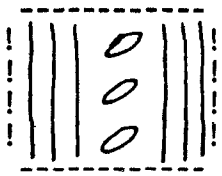
HDI motifs of the combined category are more complex than interrupted or opposed motifs, because they consist of lateral combinations (symbolized by '!') of SIM motifs from different genera and from different families. Three families of combined HDI motifs were encountered in this study, LIN ! LIN (G), LIN ! PUN (L), and LIN ! HDI (S). Following are examples:



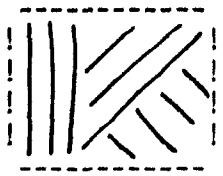
18



19



20

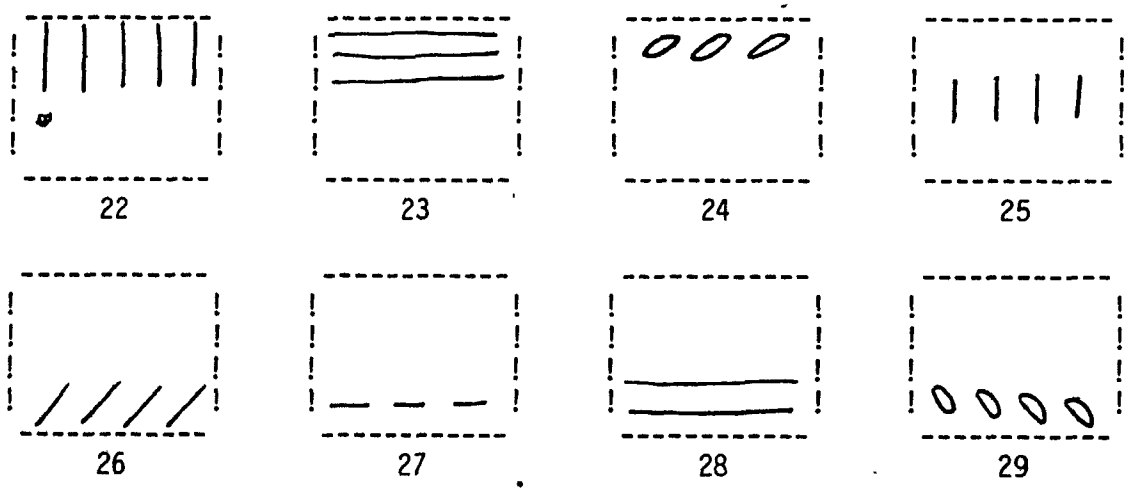


21

Of the LIN / LIN family only the genus NHO / HOR (G) was encountered. Motifs 18 and 19 illustrate the VTL / HOE (A) and OBR / HOR / OBL (F) species respectively. The variety designations are a combination of those for the individual SIM components. Single examples each of the other two families, illustrated by Motifs 20 and 21, were discovered. Although not statistically significant these two examples illustrate the

flexibility of the motif taxonomy.

The following level of complexity of motifs is the order Vertical Positioning (VPS; E). Motifs are placed in this order if the vertical location of the constituent elements in the space they occupy is important. This order was employed in the system of classification in two ways. If the motif being examined is the primary decoration, then its relationship with a Plain band is considered. Examples are displayed in Motifs 22 to 29.



Motifs 22 to 24 display SIM motifs that are located above a blank or plain space, or band. Motif 25 is located between these two blank bands, and Motifs 26 to 29 display motifs beneath blank bands. In the family designations, the blank bands are treated in the same manner as a SIM motif and are labelled PLN. In this order, and all others dependent on vertical difference, the symbol '>' is employed to express the relationship between motifs, with the motif to the left of the symbol located above the one to the right. Thus, the following family labels are Motifs 22 and 23: LIN > PLN (A); Motif 24: PUN > PLN (G); Motif 25: PLN > LIN > PLN (C); Motif 26 to 28: PLN > LIN (B); and Motif 29: PLN PUN (H). Both the genus and the species designations are determined by

the nature of the constituent SIM motif, since the other constituent is always PLN. Thus the genus and species designations, respectiyely, for these motifs are:

Motif 22: NHO > PLN (A), VTL > PLN (A);

Motif 23: HOR > PLN (B), HOE > PLN (A);

Motif 24: PUE > PLN (B), PEH > PLN (D);

Motif 25: PLN > NHO PLN (A), PLN > VTL > PLN (A);

Motif 26: PLN > NHO (A), PLN > OBR (B);

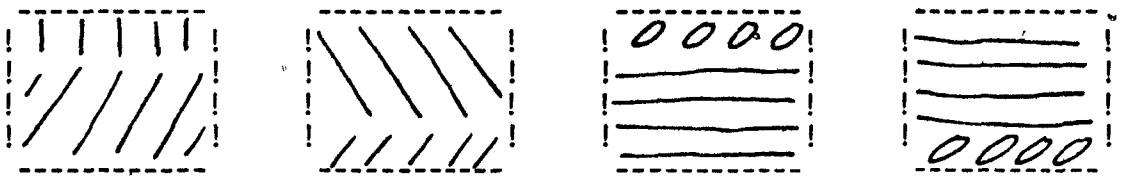
Motif 27: PLN > LDA (C), PLN > LDH (D);

Motif 28: PLN > HOR (B), PLN > HOE (A);

Motif 29: PLN > PUE (B), PLN > PEH (D).

The variety designations are determined in exactly the same manner as for the individual SIM motifs.

The second way that the VPS order was employed was to design the location of secondary decoration with respect to primary decoration. The parameters and nomenclature are the same as described above, but PLN is replaced with the primary decoration. For example, let us consider the motifs depicted below:

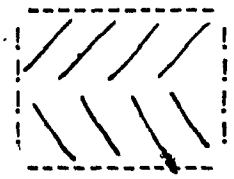


30 31 32 33

In all of these cases, the primary decoration occupies most of the space available, and the secondary elements are conceived of as minor embellishments. At the family level the secondary decoration in Motifs 30 and 31 can be labelled LIN > Primary (A) and Primary > LIN (B),

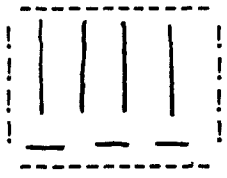
respectively. The letter designations are the same as for LIN > PLN (A) and PLN > LIN (B) since it is the positioning that is the determining factor. Thus, the family designations for Motifs 32 and 33 are PUN > Primary (G) and Primary > PUN (H), respectively. The genus, species, and variety designations for secondary VPS motifs are determined in the same manner as described above for the primary VPS motifs.

The final level of complexity in the motif taxonomy concerns variation in motif that occurs vertically. This level was conceived of as consisting of a number of increasingly complicated categories. Because of this, there are a number of orders at this level that are based on differing kinds of combinations of the motif categories described above. The least complex of these consists of vertical combinations of SIM motifs, and is labelled Vertical Difference Simple (VDS; F). Following are some examples of motifs from this order.

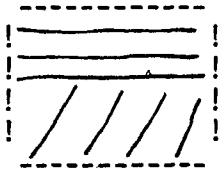


34

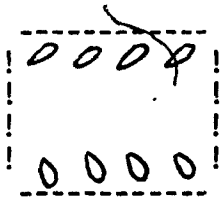
35



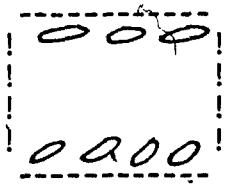
36



37



38



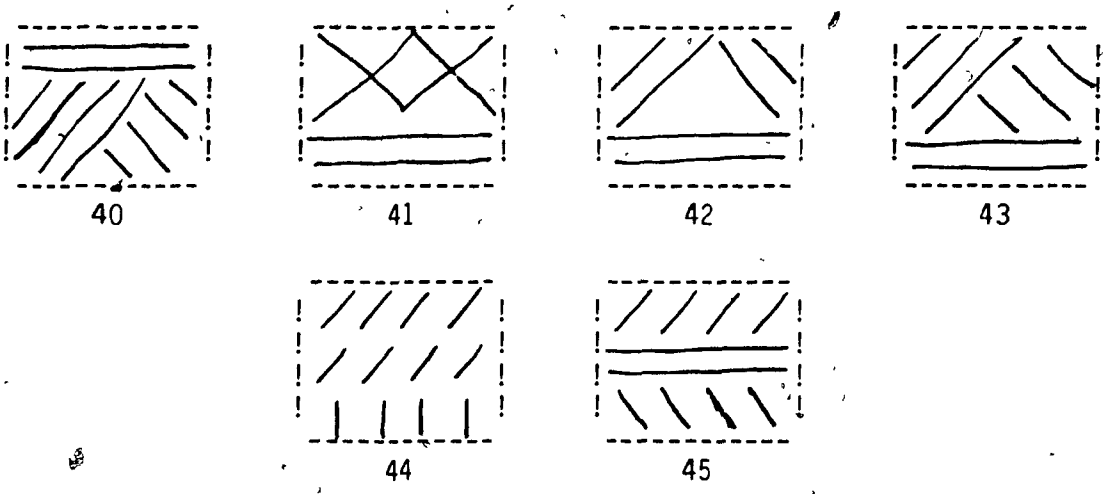
39

Motifs 34 to 37 illustrate examples from the LIN > LIN (A) family. The genus and species designations of this family, and all other families at the vertical difference level, are determined by logical permutations of the less complex constituent motifs. For example, the simplest form of vertical variation at the genus level is NHO > NHO (A), illustrated in

Motif 34. The species labels are determined by combinations of the various species of NHO (VTL, OBR, OBL). These combinations are VTL > VTL (A), VTL > OBR (B), VTL > OBL (C), OBR > VTL (D), OBR > OBR (E), OBR > OBL (F), OBL > VTL (G), OBL > OBR (H), and OBL > OBL (I). Varieties of these species are determined by a combination of the factors that apply to the NHO constituents. The same guidelines for species and variety designation apply for the other genera illustrated in Motif 35 (NHO HOR; B), Motif 36 (NHO > LDA; C) and Motif 37 (HOR > NHO; D). Motifs 38 and 39 depict examples of the PUN > PUN (I) family. This family was used, in this study, to classify secondary decoration only. For this special application, it would be more accurate to label the family PUN Primary > PUN. The rules for genera, species and variety designations are the same as those specified above. For example, both Motifs 38 and 39 are classified as PUE > PUE at the genus level, and PEH > PEH at the species level. The variety designations depend on the orientation of the individual elements.

Finally, we can deal with the more complex orders of vertical differentiation. As is the case with the rest of the 'non - SIM' levels of the taxonomy, these orders are determined by combinations and permutations of motifs of the simple order, but also take into account the nature of complexity in the lower level orders from SID to HDI. In fact, the most complex orders, as follows: SIM > SID (G), SIM > HDI (H), SID > SIM (I), SID > SID (J), SID > HDI (K), HDI > SIM (L), HDI > SID (M), HDI > HDI (N), SIM > SIM (O), SIM > SIM > SID (P), and so on. Motifs of this complexity are rare in the sample used in this study. Of those listed, only the SIM > HDI (H), SID > SIM (I), HDI > SIM (L) and SIM > SIM > SIM (O) orders were encountered. Examples of all the

families of these, three orders are depicted below.



Although more complex, the family, genus and species designations are all determined by permutations of the SIM labels. For example, at the family level, all of the above depicted motifs display various combinations of the LIN category:

Motif 40: LIN > LIN / LIN (D)

Motif 41: LIN + LIN > LIN (A)

Motif 42: LIN - LIN > LIN (A)

Motif 43: LIN / LIN > LIN (J)

Motif 44 and 45: LIN > LIN > LIN (A).

At the genus level, examples of combinations of only NHO and HOR were found:

Motif 40: HOR > NHO / NHO (D)

Motif 41: NHO + NHO / HOR (B)

Motif 42: NHO - NHO / HOR (B)

Motif 43: NHO / NHO / HOR (B)

Motif 44: NHO > NHO > NHO (A)

Motif 45: NHO > HOR > NHO (C)

At the species level, the designations are limited, of course, to

combinations of VTL, OBR, OBL, and HOE motifs:

Motif 40: HOE > OBR / OBL (C)

Motif 41: OBR x OBL > HOE (C)

Motif 42: OBR - OBL > HOE (D)

Motif 43: OBR / OBL > HOE (C)

Motif 44: OBR > OBR > VTL (I)

Motif 45: OBR > HOE > OBL (F)

The permutations of the descending categories encountered in the study of rim sections for this dissertation are presented in Appendix B. Note that not all of the possible permutations have been included, for the complete expansion would be, naturally, a more than formidable document. I have included only those categories that turned out to be relevant for classifying the motifs encountered in the artifact assemblages employed in the present study. For example, the entire Curvilinear 'family' of the 'order' Simple has been omitted because no motifs consisting of curvilinear elements were encountered. The varieties associated with each of the categories are also presented. It should be noted that only those varieties that were encountered in this study have been included. As such, then, Appendix B serves to illustrate all of the motifs that were recorded as decorating the ceramic artifacts studied in this dissertation.

There were three main reasons for constructing such a taxonomy. Firstly, I wished to simplify the process of recording motifs by constructing a system of notation that would include as much information as possible, yet facilitate identification of a detailed motif, and, at the same time, quickly provide a logical designation for it. Secondly, I wished to simplify and facilitate the process of data recovery and

manipulation. In this, I attempted to resolve the controversy of lumping versus splitting by designing a system of classification that allowed the use of both inclusive and exclusive classification without having to pick one or the other a priori. In other words, I wished to be able to decide whether to use inclusive or exclusive categories during the process of analysis and according to the needs of the study; not before this process began. Thirdly, I wished to test the use of decorative variables for which the values could be arranged in an ordinal, as opposed to a strictly nominal, fashion. As noted above, an attempt was made to arrange the motifs in a series from least to most complex. Although this is a rather crude form of an ordinal scale, some of the pattern, as described below, that emerged from an examination of decoration using this type of scale justified the attempt. I must emphasize that the formulation of this taxonomy should not be construed as an attempt on my part to infer the patterns and alternatives that influenced the artisans who decorated the ceramic artifacts. The taxonomy is meant to be an analytic tool, not directly an inferential one.

Decoration was observed on the interior, the lip, the upper portion of the exterior, and the neck portion of the rim section of a vessel. In addition, secondary decoration was observed, if it occurred, on either the upper rim or the neck, the two areas where primary decoration is most common. The distinction between primary and secondary decoration involves a certain amount of subjective judgement. Marois has defined secondary decoration, although referring to it as accessory decoration, as "... individual surface alterations repeated to cover a smaller portion (less than half) of the zone" (Marois 1984, 141). I follow his definition in this matter, adding the suggestion that the subjective

nature of secondary decoration, as with other subjective variables, can be mitigated through consistency, if the observation is always made by the same person. Secondary decoration was not recorded for the lip and interior of a pot, because it so rarely, if ever, occurs on these areas in the sample under investigation. Decorative element was not recorded for secondary decoration in this study because the element was so apparent in the motifs (almost always punctates) that this information was felt to be redundant. I recommend, however, that secondary element be recorded, at least initially, in other studies.

All of the variables of decorative element and decorative motif, respectively, share the same values. For example, the elements for interior, lip, upper rim, and neck decoration were selected from the same list, and the motifs for the decoration on these same areas of a pot were all selected from the same motif chart. This is contrary to other researchers (e.g. Pearce 1978) who have constructed a separate set of motif charts for each different area of a pot.

Other Variables

The variables and values discussed above make up the main analytic entities that were employed in this dissertation. A few other variables and values were recorded for additional data. The traditional types formulated by MacNeish were recorded, and have been discussed in the previous chapter. Also recorded, but not included for discussion in this study, were variables for which only one value was observed, and which were therefore inessential. These include temper (all were grit tempered) and lip form (all lips were flat). Castellation form and decoration are not included because they were observable in very few cases.

5.2.2 Analytic Variables and Values for Smoking Pipe Bowl Sections

Variables of Bowl Shape

Exterior Bowl Orientation

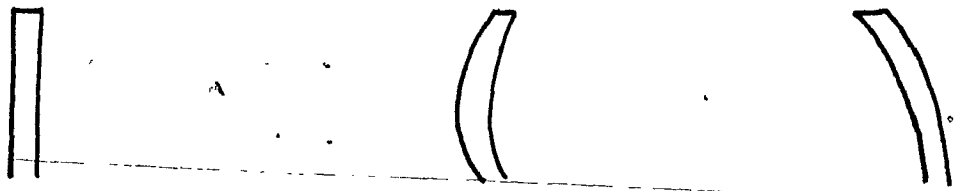
The values of this nominal variable refer to the overall orientation of the pipe bowl viewed from the exterior.

Bulbous Insloping Vertical Outflaring

Exterior and Interior Bowl Profiles

The values of these nominal variables refer to the shape of the exterior and interior of the bowl section, respectively, when viewed in profile.

<-- Exterior



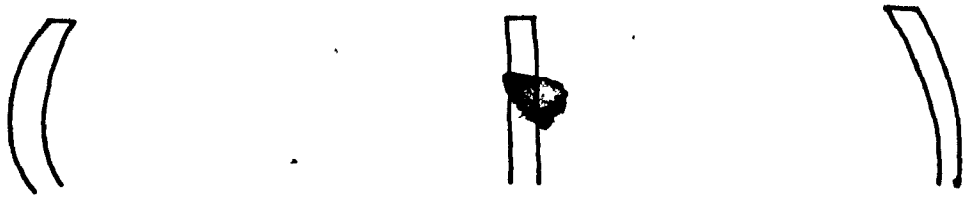
Straight Convex Concave

Interior ---->

Straight Convex Concave

Angle of Lip to the Interior

The values of this nominal variable indicate the orientation of the lip to the rest of the bowl.



Acute Right Obtuse

Lip Thickness

The values of this variable are the only interval measurements that could be consistently recorded from the bowl sections. Lip thickness was measured only on sections where the full lip was intact.

Variables of Bowl Decoration

The rationale for selection of variables and values of decoration for ceramic pipe bowls is exactly the same as that for pottery rim sections. In effect, each bowl section was treated the same manner as a collarless rim section. Decoration was observed on the interior, lip, and exterior bowl surfaces of each bowl section. The motifs from the interiors and lips are not included for further discussion because they were all plain. The values for decorative element are the same as those used for rim sections, and the same taxonomy of decorative motifs was employed. Secondary decorative motif on the exterior bowl surface was treated in the same manner as that for upper rim decoration.

Other Variables

Emerson's pipe typology was applied to the bowl sections; the results are discussed in the previous chapter. Kind of tempering was also recorded, but not included for discussion in this study because only one value (fine grit) was observed.

5.3 Examination of Analytical Entities

This section is devoted to an investigation of variation in the data set using the analytical variables and values identified in the previous section. The objectives of this examination are twofold: (1) to evaluate the model presented in Chapter 4.0; and (2) to discover or identify patterns that can be used to refine the model. The examination will be conducted using the interactive framework of levels of inference, in the same manner as our model was constructed. In doing this I will be describing the procedures I used to examine, evaluate, and interpret patterns of variation and the results of these procedures. The purpose was to isolate essential attribute variation from the 'noise' of inessential variation, and further, to identify key attribute variation useful for generating inference (see Clarke 1968).

5.3.1 Form

The data recorded from both the rim and bowl sections was first examined for any statistical patterns or anomalies that could be useful for further examination or inference. Although the application of statistical methods to archaeological data is a relatively recent approach, there are a number of procedures that have been used in attempts to discover pattern in variation of Iroquoian ceramic data at the level of form. These include simple descriptive statistics (frequencies and percentages), and, based on these, interpretive

statistics such as measures of clustering and association. All of these have been employed in the present study, and each will be discussed in turn below.

The values of the variables, as described in the previous section, were recorded in the most exclusive (or split) format designed for this particular body of data; this format is always referred to as Format 1. The frequencies and percentages of the Format 1 data for the rim section variables are presented in Tables 12 - 51, and for the pipe bowl sections in Tables 52 - 67. These data are separated into tables for Group 1 and Group 2 sites and the sites are listed in their inferred chronological order. This arrangement was used to facilitate later discussion. The absolute frequencies and percentages were initially examined as a whole, and not divided along the strict lines of these groups. The values for all of the variables should be understandable in terms of the descriptions supplied above (Section 5.2) and in the appendices. For a detailed examination of the motif designations, the reader is directed to Appendix C.

Table 12: Frequencies of Rim Section Attributes for Group 1 Sites: Rim Form (Format 1)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Collared	249	86.76	45	83.33	106	89.83	77	88.51
Collarless	38	13.24	9	16.67	12	10.17	10	11.49
TOTAL	287		54		118		87	

Table 13: Frequencies of Rim Section Attributes for Group 2 Sites: Rim Form (Format 1)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Collared	145	99.32	368	94.60	162	92.57	95	95.00
Collarless	1	0.68	21	5.40	12	6.86	5	5.00
Everted Lip	0	0.00	0	0.00	1	0.57	0	0.00
TOTAL	146		389		175		100	

Table 14: Frequencies of Rim Section Attributes for Group 1 Sites: Rim Orientation (Format 1)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Vertical	72	51.06	20	55.56	61	75.31	23	88.46
Outflaring	67	47.52	16	44.44	20	24.69	2	7.69
Insloping	2	1.42	0	0.00	0	0.00	1	3.85
TOTAL	141		36		81		26	

Table 15: Frequencies of Rim Section Attributes for Group 2 Sites: Rim Orientation (Format 1)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Vertical	64	68.82	86	39.45	64	68.82	27	58.70
Outflaring	27	29.03	130	59.63	28	30.11	18	39.13
Insloping	2	2.15	2	0.92	1	1.08	1	2.17
TOTAL	93		218		93		46	

Table 16: Frequencies of Rim Section Attributes for Group 1 Sites: Exterior Rim Profile (Format 1)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Straight	118	41.11	25	46.30	47	39.83	45	51.72
Concave	23	8.01	8	14.81	8	6.78	6	6.90
Extra Concave	8	2.79	2	3.70	2	1.69	5	5.75
Convex	70	24.39	10	18.52	31	26.27	21	24.14
Extra Convex	68	23.69	9	16.67	30	25.42	10	11.49
TOTAL	287		54		118		87	

Table 17: Frequencies of Rim Section Attributes for Group 2 Sites: Exterior Rim Profile (Format 1)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Straight	63	43.15	195	50.13	78	44.57	49	49.00
Concave	16	10.96	69	17.74	17	9.71	14	14.00
Extra Concave	14	9.59	32	8.23	15	8.57	2	2.00
Convex	21	14.38	65	16.71	34	19.43	19	19.00
Extra Convex	32	21.92	28	7.20	31	17.71	16	16.00
TOTAL	146		389		175		100	

Table 18: Frequencies of Rim Section Attributes for Group 1 Sites: Interior Rim Profile (Format 1)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Straight	74	25.96	20	37.74	33	27.97	26	30.95
Concave	104	36.49	17	32.08	24	20.34	27	32.14
Extra Concave	81	28.42	14	26.42	51	43.22	23	27.38
Convex	15	5.26	0	0.00	10	8.47	7	8.33
Extra Convex	11	3.86	2	3.77	0	0.00	1	1.19
TOTAL	285		53		118		84	

Table 19: Frequencies of Rim Section Attributes for Group 2 Sites: Interior Rim Profile (Format 1)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Straight	42	28.77	127	32.99	59	34.50	30	31.25
Concave	36	24.66	133	34.55	34	19.88	38	39.58
Extra Concave	53	36.30	55	14.29	34	19.88	20	20.83
Convex	5	3.42	45	11.69	28	16.37	6	6.25
Extra Convex	10	6.85	25	6.49	16	9.36	2	2.08
TOTAL	146		385		171		96	

Table 20: Frequencies of Rim Section Attributes for Group 1 Sites: Angle of Lip to Interior (Format 1)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Acute	57	20.14	8	15.09	25	21.19	13	16.46
Right	163	57.60	33	62.26	75	63.56	53	67.09
Obtuse	63	22.26	12	22.64	18	15.25	13	16.46
TOTAL	283		53		118		79	

Table 21: Frequencies of Rim Section Attributes for Group 2 Sites: Angle of Lip to Interior (Format 1)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Acute	32	21.92	36	9.30	9	5.23	5	5.10
Right	91	62.33	234	60.47	79	45.93	44	44.90
Obtuse	23	15.75	117	30.23	84	48.84	49	50.00
TOTAL	146		387		172		98	

Table 22: Frequencies of Rim Section Attributes for Group 1 Sites: Collar Base Shape (Format 1)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Poorly Developed	129	52.22	26	56.52	84	79.24	48	62.34
Well Developed	115	46.56	16	34.78	20	18.86	26	33.77
Highly Developed	3	1.21	4	8.70	2	1.89	3	3.90
TOTAL	247		46		106		77	

Table 23: Frequencies of Rim Section Attributes for Group 2 Sites: Collar Base Shape (Format 1)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Poorly Developed	73	51.05	157	42.32	116	71.17	62	65.96
Well Developed	59	41.26	203	54.72	46	28.22	30	31.91
Highly Developed	11	7.69	11	2.96	1	0.61	2	2.13
TOTAL	143		371		163		94	

Table 24: Frequencies of Rim Section Attributes for Group 1 Sites: Collar Height (Format 1)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
5 mm.	1	0.40	0	0.00	0	0.00	0	0.00
7 mm.	1	0.40	1	2.22	4	3.77	0	0.00
8 mm.	2	0.80	0	0.00	6	5.66	2	2.74
9 mm.	2	0.80	0	0.00	2	1.89	3	4.11
10 mm.	6	2.41	2	4.44	1	0.94	2	2.74
11 mm.	6	2.41	1	2.22	7	6.60	3	4.11
12 mm.	8	3.21	5	11.11	10	9.43	6	8.22
13 mm.	7	2.81	3	6.67	13	12.26	4	5.48
14 mm.	9	3.61	6	13.33	11	10.38	5	6.85
15 mm.	8	3.21	4	8.89	1	0.94	2	2.74
16 mm.	13	5.22	7	15.56	4	3.77	7	9.59
17 mm.	14	5.62	1	2.22	6	5.66	5	6.85
18 mm.	11	4.42	3	6.67	9	8.49	4	5.48
19 mm.	8	3.21	2	4.44	8	7.55	7	9.59
20 mm.	15	6.02	2	4.44	5	4.72	3	4.11

(continued on following page)

Table 24: (cont.) Frequencies of Rim Section Attributes for Group 1 Sites: Collar Height (Format 1)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
21 mm.	17	6.83	0	0.00	3	2.83	1	1.37
22 mm.	12	4.82	0	0.00	4	3.77	3	4.11
23 mm.	14	5.62	2	4.44	2	1.89	1	1.37
24 mm.	8	3.21	1	2.22	1	0.94	3	4.11
25 mm.	11	4.42	0	0.00	1	0.94	1	1.37
26 mm.	13	5.22	1	2.22	0	0.00	3	4.11
27 mm.	11	4.42	0	0.00	1	0.94	1	1.37
28 mm.	6	2.41	1	2.22	0	0.00	2	2.74
29 mm.	4	1.61	1	2.22	0	0.00	0	0.00
30 mm.	3	1.20	0	0.00	0	0.00	0	0.00
31 mm.	3	1.20	0	0.00	1	0.94	0	0.00
32 mm.	2	0.80	1	2.22	0	0.00	0	0.00
33 mm.	1	0.40	0	0.00	0	0.00	0	0.00
34 mm.	1	0.40	0	0.00	0	0.00	1	1.37
35 mm.	2	0.80	0	0.00	1	0.94	1	1.37
36 mm.	1	0.40	0	0.00	0	0.00	0	0.00
37 mm.	1	0.40	0	0.00	0	0.00	0	0.00
38 mm.	1	0.40	0	0.00	0	0.00	0	0.00
39 mm.	1	0.40	0	0.00	0	0.00	0	0.00
40 mm.	1	0.40	0	0.00	0	0.00	0	0.00
41 mm.	1	0.40	0	0.00	1	0.94	1	1.37
42 mm.	0	0.00	0	0.00	1	0.94	0	0.00
44 mm.	1	0.40	0	0.00	0	0.00	0	0.00
47 mm.	0	0.00	0	0.00	1	0.94	0	0.00
48 mm.	1	0.40	0	0.00	0	0.00	0	0.00
50 mm.	1	0.40	0	0.00	2	1.89	0	0.00
51 mm.	1	0.40	0	0.00	0	0.00	0	0.00
53 mm.	2	0.80	0	0.00	0	0.00	0	0.00
54 mm.	2	0.80	1	2.22	0	0.00	0	0.00
55 mm.	2	0.80	0	0.00	0	0.00	0	0.00
57 mm.	1	0.40	0	0.00	0	0.00	0	0.00
58 mm.	1	0.40	0	0.00	0	0.00	0	0.00
61 mm.	1	0.40	0	0.00	0	0.00	0	0.00
62 mm.	2	0.80	0	0.00	0	0.00	0	0.00
63 mm.	1	0.40	0	0.00	0	0.00	1	1.37
65 mm.	2	0.80	0	0.00	0	0.00	0	0.00
66 mm.	1	0.40	0	0.00	0	0.00	0	0.00
67 mm.	1	0.40	0	0.00	0	0.00	0	0.00
69 mm.	1	0.40	0	0.00	0	0.00	0	0.00
72 mm.	1	0.40	0	0.00	0	0.00	0	0.00
75 mm.	1	0.40	0	0.00	0	0.00	0	0.00
82 mm.	1	0.40	0	0.00	0	0.00	0	0.00
142 mm.	0	0.00	0	0.00	0	0.00	1	1.37
TOTAL	249		45		106		73	

Table 25: Frequencies of Rim Section Attributes for Group 2 Sites: Collar Height (Format 1)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
4 mm.	0	0.00	0	0.00	1	0.61	0	0.00
7 mm.	0	0.00	0	0.00	3	1.84	0	0.00
8 mm.	0	0.00	1	0.27	1	0.61	2	2.11
9 mm.	0	0.00	3	0.82	2	1.23	2	2.11
10 mm.	2	1.38	10	2.72	4	2.45	5	5.26
11 mm.	2	1.38	5	1.36	5	3.07	5	5.26
12 mm.	4	2.76	9	2.45	7	4.29	4	4.21
13 mm.	3	2.07	13	3.53	11	6.75	10	10.53
14 mm.	2	1.38	11	2.99	16	9.82	3	3.16
15 mm.	10	6.90	16	4.35	6	3.68	10	10.53
16 mm.	9	6.21	13	3.53	9	5.52	5	5.26
17 mm.	6	4.14	15	4.08	11	6.75	8	8.42
18 mm.	10	6.90	18	4.89	5	3.07	6	6.32
19 mm.	7	4.83	12	3.26	2	1.23	3	3.16
20 mm.	7	4.83	23	6.25	10	6.13	6	6.32
21 mm.	11	7.59	25	6.79	7	4.29	3	3.16
22 mm.	11	7.59	20	5.43	5	3.07	4	4.21
23 mm.	10	6.90	15	4.08	4	2.45	5	5.26
24 mm.	4	2.76	11	2.99	3	1.84	0	0.00
25 mm.	6	4.14	18	4.89	2	1.23	3	3.16
26 mm.	7	4.83	15	4.08	3	1.84	2	2.11
27 mm.	6	4.14	14	3.80	3	1.84	2	2.11
28 mm.	6	4.14	10	2.72	1	0.61	2	2.11
29 mm.	3	2.07	7	1.90	4	2.45	0	0.00
30 mm.	1	0.69	9	2.45	4	2.45	1	1.05
31 mm.	2	1.38	6	1.63	5	3.07	0	0.00
32 mm.	2	1.38	8	2.17	2	1.23	0	0.00
33 mm.	4	2.76	9	2.45	1	0.61	1	1.05
34 mm.	0	0.00	4	1.09	0	0.00	0	0.00
35 mm.	2	1.38	5	1.36	1	0.61	0	0.00
36 mm.	1	0.69	5	1.36	2	1.23	0	0.00
37 mm.	1	0.69	3	0.82	1	0.61	0	0.00
38 mm.	0	0.00	4	1.09	2	1.23	0	0.00
39 mm.	1	0.69	3	0.82	0	0.00	1	1.05
40 mm.	1	0.69	1	0.27	3	1.84	0	0.00
41 mm.	1	0.69	1	0.27	2	1.23	0	0.00
42 mm.	0	0.00	4	1.09	3	1.84	0	0.00
43 mm.	0	0.00	2	0.54	3	1.84	0	0.00
44 mm.	0	0.00	1	0.27	1	0.61	0	0.00
45 mm.	1	0.69	2	0.54	2	1.23	0	0.00
46 mm.	0	0.00	0	0.00	1	0.61	1	1.05
47 mm.	0	0.00	2	0.54	0	0.00	0	0.00
49 mm.	0	0.00	2	0.54	3	1.84	0	0.00
50 mm.	0	0.00	2	0.54	0	0.00	0	0.00
51 mm.	0	0.00	2	0.54	0	0.00	0	0.00
52 mm.	0	0.00	1	0.27	1	0.61	0	0.00
53 mm.	1	0.69	2	0.54	1	0.61	1	1.05

(continued on following page)

Table 25: Frequencies of Rim Section Attributes for Group 2 Sites: (cont.) Collar Height (Format 1)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
57 mm.	0	0.00	1	0.27	0	0.00	0	0.00
58 mm.	0	0.00	1	0.27	0	0.00	0	0.00
59 mm.	1	0.69	1	0.27	0	0.00	0	0.00
61 mm.	0	0.00	1	0.27	0	0.00	0	0.00
67 mm.	0	0.00	1	0.27	0	0.00	0	0.00
79 mm.	0	0.00	1	0.27	0	0.00	0	0.00
TOTAL	145		368		163		95	

Table 26: Frequencies of Rim Section Attributes for Group 1 Sites: Lip Thickness (Format 1)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
3 mm.	1	0.35	0	0.00	0	0.00	0	0.00
4 mm.	7	2.46	0	0.00	1	0.85	1	1.23
5 mm.	23	8.10	5	9.43	12	10.26	8	9.88
6 mm.	62	21.83	6	11.32	32	27.35	21	25.93
7 mm.	81	28.52	8	15.09	32	27.35	25	30.86
8 mm.	60	21.13	11	20.75	22	18.80	18	22.22
9 mm.	38	13.38	15	28.30	10	8.55	8	9.88
10 mm.	10	3.52	6	11.32	8	6.84	0	0.00
11 mm.	1	0.35	1	1.89	0	0.00	0	0.00
12 mm.	1	0.35	1	1.89	0	0.00	0	0.00
TOTAL	284		53		117		81	

Table 27: Frequencies of Rim Section Attributes for Group 2 Sites: Lip Thickness (Format 1)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
1 mm.	0	0.00	0	0.00	0	0.00	2	2.06
2 mm.	0	0.00	0	0.00	2	1.16	1	1.03
3 mm.	3	2.05	1	0.26	6	3.49	3	3.09
4 mm.	11	7.53	19	4.92	13	7.56	10	10.31
5 mm.	28	19.18	70	18.13	34	19.77	12	12.37
6 mm.	51	34.93	96	24.87	40	23.26	22	22.68
7 mm.	29	19.86	90	23.32	28	16.28	23	23.71
8 mm.	16	10.96	64	16.58	33	19.19	13	13.40
9 mm.	5	3.42	37	9.59	7	4.07	3	3.09
10 mm.	3	2.05	4	1.04	6	3.49	6	6.19
11 mm.	0	0.00	2	0.52	2	1.16	1	1.03
12 mm.	0	0.00	3	0.78	1	0.58	1	1.03
TOTAL	146		386		172		97	

Table 28: Frequencies of Rim Section Attributes for Group 1 Sites: Collar Base Thickness (Format 1)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
5 mm.	1	0.41	0	0.00	0	0.00	0	0.00
6 mm.	4	1.66	1	2.33	0	0.00	0	0.00
7 mm.	12	4.98	1	2.33	4	3.81	6	7.89
8 mm.	15	6.22	1	2.33	13	12.38	6	7.89
9 mm.	36	14.94	6	13.95	16	15.24	13	17.11
10 mm.	41	17.01	8	18.60	24	22.86	16	21.05
11 mm.	41	17.01	4	9.30	16	15.24	18	23.68
12 mm.	30	12.45	9	20.93	17	16.19	3	3.95
13 mm.	33	13.69	3	6.98	9	8.57	9	11.84
14 mm.	13	5.39	7	16.28	2	1.90	1	1.32
15 mm.	12	4.98	2	4.65	3	2.86	2	2.63
16 mm.	2	0.83	0	0.00	1	0.95	1	1.32
17 mm.	1	0.41	1	2.33	0	0.00	0	0.00
19 mm.	0	0.00	0	0.00	0	0.00	1	1.32
TOTAL	241		43		105		76	

Table 29: Frequencies of Rim Section Attributes for Group 2 Sites: Collar Base Thickness (Format 1)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
4 mm.	0	0.00	0	0.00	1	0.64	0	0.00
5 mm.	2	1.39	2	0.55	0	0.00	0	0.00
6 mm.	4	2.78	7	1.93	10	6.37	2	2.25
7 mm.	10	6.94	17	4.68	6	3.82	4	4.49
8 mm.	18	12.50	35	9.64	16	10.19	6	6.74
9 mm.	19	13.19	54	14.88	28	17.83	21	23.60
10 mm.	26	18.06	49	13.50	31	19.75	20	22.47
11 mm.	22	15.28	44	12.12	18	11.46	15	16.85
12 mm.	14	9.72	49	13.50	13	8.28	11	12.36
13 mm.	16	11.11	44	12.12	13	8.28	7	7.87
14 mm.	11	7.64	36	9.92	15	9.55	2	2.25
15 mm.	1	0.69	13	3.58	3	1.91	1	1.12
16 mm.	1	0.69	6	1.65	1	0.64	0	0.00
17 mm.	0	0.00	2	0.55	1	0.64	0	0.00
18 mm.	0	0.00	2	0.55	1	0.64	0	0.00
20 mm.	0	0.00	1	0.28	0	0.00	0	0.00
40 mm.	0	0.00	2	0.55	0	0.00	0	0.00
TOTAL	144		363		157		89	

Table 30: Frequencies of Rim Section Attributes for Group 1 Sites: Rim Diameter at Lip (Format 1)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
80 mm.	0	0.00	0	0.00	0	0.00	1	1.92
90 mm.	3	1.97	2	10.00	0	0.00	0	0.00
100 mm.	3	1.97	0	0.00	1	2.00	0	0.00
110 mm.	5	3.29	0	0.00	0	0.00	1	1.92
120 mm.	5	3.29	1	5.00	1	2.00	0	0.00
130 mm.	4	2.63	2	10.00	2	4.00	0	0.00
140 mm.	3	1.97	0	0.00	1	2.00	1	1.92
150 mm.	6	3.95	0	0.00	2	4.00	6	11.54
160 mm.	2	1.32	0	0.00	4	8.00	2	3.85
170 mm.	5	3.29	1	5.00	1	2.00	0	0.00
180 mm.	4	2.63	0	0.00	2	4.00	1	1.92
190 mm.	2	1.32	0	0.00	2	4.00	2	3.85
200 mm.	18	11.84	1	5.00	7	14.00	2	3.85
210 mm.	4	2.63	0	0.00	0	0.00	2	3.85
220 mm.	3	1.97	0	0.00	2	4.00	0	0.00
230 mm.	2	1.32	1	5.00	1	2.00	2	3.85
240 mm.	4	2.63	0	0.00	2	4.00	2	3.85

(continued on following page)

Table 30: Frequencies of Rim Section Attributes for Group 1 Sites: (cont.) Rim Diameter at Lip (Format 1)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
250 mm.	12	7.89	2	10.00	2	4.00	2	3.85
260 mm.	1	0.66	2	10.00	1	2.00	7	13.46
270 mm.	9	5.92	3	15.00	1	2.00	4	7.69
280 mm.	2	1.32	0	0.00	1	2.00	1	1.92
290 mm.	6	3.95	1	5.00	2	4.00	0	0.00
300 mm.	14	9.21	2	10.00	3	6.00	4	7.69
310 mm.	1	0.66	0	0.00	1	2.00	2	3.85
320 mm.	3	1.97	1	5.00	0	0.00	0	0.00
330 mm.	4	2.63	0	0.00	0	0.00	2	3.85
340 mm.	3	1.97	0	0.00	1	2.00	0	0.00
350 mm.	6	3.95	1	5.00	0	0.00	0	0.00
360 mm.	3	1.97	0	0.00	0	0.00	0	0.00
370 mm.	0	0.00	0	0.00	1	2.00	0	0.00
380 mm.	3	1.97	0	0.00	0	0.00	1	1.92
390 mm.	1	0.66	0	0.00	2	4.00	1	1.92
400 mm.	3	1.97	0	0.00	2	4.00	0	0.00
410 mm.	0	0.00	0	0.00	0	0.00	1	1.92
420 mm.	2	1.32	0	0.00	0	0.00	1	1.92
430 mm.	1	0.66	0	0.00	2	4.00	0	0.00
440 mm.	0	0.00	0	0.00	1	2.00	1	1.92
450 mm.	1	0.66	0	0.00	2	4.00	1	1.92
480 mm.	1	0.66	0	0.00	0	0.00	1	1.92
500 mm.	2	1.32	0	0.00	0	0.00	0	0.00
510 mm.	1	0.66	0	0.00	0	0.00	0	0.00
520 mm.	0	0.00	0	0.00	0	0.00	1	1.92
TOTAL	152		20		50		52	

Table 31: Frequencies of Rim Section Attributes for Group 2 Sites: Rim Diameter at Lip (Format 1)

ATTRIBUTES	SITES Chypchar N	Chypchar %	Pipeline N	Pipeline %	Campbell N	Campbell %	Milton N	Milton %
80 mm.	0	0.00	0	0.00	1	1.08	0	0.00
90 mm.	3	3.70	7	3.47	3	3.23	1	2.33
100 mm.	3	3.70	4	1.98	4	4.30	1	2.33
110 mm.	5	6.17	6	2.97	2	2.15	1	2.33
120 mm.	2	2.47	6	2.97	5	5.38	2	4.65
130 mm.	7	8.64	15	7.43	4	4.30	1	2.33
140 mm.	1	1.23	1	0.50	2	2.15	2	4.65
150 mm.	4	4.94	6	2.97	4	4.30	1	2.33
160 mm.	3	3.70	8	3.96	3	3.23	1	2.33

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Table 31: Frequencies of Rim Section Attributes for Group 2 Sites: (cont.) Rim Diameter at Lip (Format 1)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
170 mm.	5	6.17	29	14.36	6	6.45	6	13.95
180 mm.	3	3.70	5	2.48	3	3.23	3	6.98
190 mm.	2	2.47	4	1.98	1	1.08	1	2.33
200 mm.	10	12.35	21	10.40	15	16.13	7	16.28
210 mm.	4	4.94	2	0.99	1	1.08	1	2.33
220 mm.	5	6.17	3	1.49	3	3.23	2	4.65
230 mm.	3	3.70	4	1.98	2	2.15	0	0.00
240 mm.	2	2.47	1	0.50	1	1.08	3	6.98
250 mm.	5	6.17	17	8.42	10	10.75	1	2.33
260 mm.	3	3.70	5	2.48	1	1.08	0	0.00
270 mm.	0	0.00	6	2.97	1	1.08	0	0.00
280 mm.	0	0.00	5	2.48	2	2.15	1	2.33
290 mm.	1	1.23	4	1.98	3	3.23	0	0.00
300 mm.	4	4.94	5	2.48	2	2.15	2	4.65
310 mm.	0	0.00	2	0.99	1	1.08	1	2.33
320 mm.	1	1.23	5	2.48	2	2.15	0	0.00
330 mm.	2	2.47	4	1.98	0	0.00	0	0.00
340 mm.	0	0.00	5	2.48	1	1.08	0	0.00
350 mm.	0	0.00	11	5.45	1	1.08	2	4.65
360 mm.	0	0.00	1	0.50	2	2.15	0	0.00
370 mm.	0	0.00	2	0.99	1	1.08	0	0.00
380 mm.	0	0.00	1	0.50	0	0.00	0	0.00
390 mm.	2	2.47	0	0.00	2	2.15	1	2.33
400 mm.	0	0.00	3	1.49	1	1.08	1	2.33
410 mm.	0	0.00	2	0.99	1	1.08	0	0.00
420 mm.	1	1.23	1	0.50	0	0.00	1	2.33
450 mm.	0	0.00	1	0.50	0	0.00	0	0.00
460 mm.	0	0.00	0	0.00	1	1.08	0	0.00
500 mm.	0	0.00	0	0.00	1	1.08	0	0.00
TOTAL	81		202		93		43	

Table 32: Frequencies of Rim Section Attributes for Group 1 Sites: Interior Rim Decorative Element (Format 1)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	232	81.40	40	75.47	96	81.36	56	70.89
Trail	1	0.35	1	1.89	1	0.85	1	1.27
Linear Stamp	22	7.72	4	7.55	14	11.86	11	13.92
Curvilinear Stamp	0	0.00	1	1.89	0	0.00	0	0.00
Punctate	30	10.53	7	13.21	7	5.93	11	13.92
TOTAL	285		53		118		79	

Table 33: Frequencies of Rim Section Attributes for Group 2 Sites: Interior Rim Decorative Element (Format 1)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	137	93.84	382	98.71	138	80.70	95	98.96
Trail	1	0.68	0	0.00	1	0.58	0	0.00
Linear Stamp	2	1.37	1	0.26	6	3.51	0	0.00
Punctate	6	4.11	4	1.03	20	11.70	1	1.04
Notch	0	0.00	0	0.00	6	3.51	0	0.00
TOTAL	146		387		171		96	

Table 34: Frequencies of Rim Section Attributes for Group 1 Sites: Interior Rim Motif (Format 1)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	232	81.40	40	75.47	96	81.36	56	70.89
BAAA11	4	1.40	0	0.00	4	3.39	3	3.80
BAAB11	11	3.86	2	3.77	5	4.24	6	7.59
BCAB02	0	0.00	1	1.89	0	0.00	0	0.00
BCAD01	0	0.00	0	0.00	0	0.00	1	1.27
BCBD01	1	0.35	0	0.00	0	0.00	0	0.00
EAAA11	0	0.00	0	0.00	1	0.85	0	0.00
EAAA12	1	0.35	0	0.00	0	0.00	0	0.00
EAAB11	6	2.11	0	0.00	1	0.85	2	2.53
EAAB12	1	0.35	1	1.89	4	3.39	0	0.00
EAAC12	0	0.00	0	0.00	0	0.00	1	1.27
EBAB11	0	0.00	2	3.77	0	0.00	0	0.00
EGAD11	1	0.35	0	0.00	0	0.00	0	0.00
EGBD11	4	1.40	1	1.89	1	0.85	1	1.27
EGBD21	22	7.72	4	7.55	5	4.24	8	10.13
EGBD31	1	0.35	1	1.89	0	0.00	1	1.27
EHBD11	1	0.35	1	1.89	0	0.00	0	0.00
EHBD21	0	0.00	0	0.00	1	0.85	0	0.00
TOTAL	285		53		118		79	

Table 35: Frequencies of Rim Section Attributes for Group 2 Sites: Interior Rim Motif (Format 1)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	137	93.84	382	98.71	138	80.70	95	98.96
BAAA11	1	0.68	0	0.00	0	0.00	0	0.00
BAAB11	1	0.68	0	0.00	0	0.00	0	0.00
BCBD11	0	0.00	0	0.00	1	0.58	0	0.00
EAAA12	1	0.68	0	0.00	1	0.58	0	0.00
EAAA14	0	0.00	0	0.00	2	1.17	0	0.00
EAAB12	0	0.00	1	0.26	1	0.58	0	0.00
EAAB14	0	0.00	0	0.00	3	1.75	0	0.00
EGAD11	2	1.37	0	0.00	6	3.51	1	1.04
EGBD11	2	1.37	1	0.26	9	5.26	0	0.00
EGBD21	2	1.37	3	0.78	10	5.85	0	0.00
TOTAL	146		387		171		96	

Table 36: Frequencies of Rim Section Attributes for Group 1 Sites: Lip Decorative Element (Format 1)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	257	89.55	35	64.81	91	77.12	74	90.24
Trail	15	5.23	12	22.22	20	16.95	7	8.54
Linear Stamp	4	1.39	4	7.41	7	5.93	1	1.22
Spiral Stamp	0	0.00	1	1.85	0	0.00	0	0.00
Punctate	8	2.79	2	3.70	0	0.00	0	0.00
Notch	2	0.70	0	0.00	0	0.00	0	0.00
Trail + Lin. Stamp	1	0.35	0	0.00	0	0.00	0	0.00
TOTAL	287		54		118		82	

Table 37: Frequencies of Rim Section Attributes for Group 2 Sites: Lip Decorative Element (Format 1)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	143	97.95	362	93.06	169	97.13	97	97.98
Trail	2	1.37	9	2.31	3	1.72	0	0.00
Linear Stamp	0	0.00	4	1.03	2	1.15	0	0.00
Punctate	1	0.68	14	3.60	0	0.00	2	2.02
TOTAL	146		389		174		99	

Table 38: Frequencies of Rim Section Attributes for Group 1 Sites: Lip Motif (Format 1)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Plain	257	89.55	35	64.81	91	77.12	74	90.24
BAAA11	3	1.05	1	1.85	0	0.00	0	0.00
BAAB11	3	1.05	2	3.70	3	2.54	1	1.22
BAAB12	0	0.00	0	0.00	1	0.85	0	0.00
BAAC11	0	0.00	0	0.00	2	1.69	0	0.00
BABA01	13	4.53	11	20.37	20	16.95	7	8.54
BABA02	0	0.00	2	3.70	0	0.00	0	0.00
BABA92	1	0.35	0	0.00	0	0.00	0	0.00
BACD01	0	0.00	1	1.85	0	0.00	0	0.00
BCBD01	5	1.74	1	1.85	0	0.00	0	0.00
BCBD11	2	0.70	0	0.00	0	0.00	0	0.00
BCBD21	2	0.70	0	0.00	0	0.00	0	0.00
EAAA14	0	0.00	0	0.00	1	0.85	0	0.00
EGBD31	1	0.35	0	0.00	0	0.00	0	0.00
EHBD11	0	0.00	1	1.85	0	0.00	0	0.00
TOTAL	287		54		118		82	

Table 39: Frequencies of Rim Section Attributes for Group 2 Sites: Lip Motif (Format 1)

ATTRIBUTES	SITES Chypchar N	Chypchar %	Pipeline N	Pipeline %	Campbell N	Campbell %	Milton N	Milton %
Plain	143	97.95	362	93.06	169	97.13	97	97.98
BAAB11	0	0.00	2	0.51	0	0.00	0	0.00
BABA01	2	1.37	10	2.57	3	1.72	0	0.00
BACD01	0	0.00	1	0.26	0	0.00	0	0.00
BCAB01	0	0.00	0	0.00	0	0.00	1	1.01
BCBD01	0	0.00	0	0.00	0	0.00	1	1.01
BCBD11	0	0.00	2	0.51	0	0.00	0	0.00
BCBD21	0	0.00	10	2.57	0	0.00	0	0.00
BCBD31	0	0.00	2	0.51	2	1.15	0	0.00
EGAD11	1	0.68	0	0.00	0	0.00	0	0.00
TOTAL	146		389		174		99	

Table 40: Frequencies of Rim Section Attributes for Group 1 Sites: Upper Rim Decorative Element (Format 1)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	0	0.00	0	0.00	1	0.85	1	1.15
Trail	123	42.86	20	37.04	54	45.76	23	26.44
Over Trail	0	0.00	0	0.00	2	1.69	0	0.00
Linear Stamp	79	27.53	15	27.78	35	29.66	36	41.38
Dentate Stamp	0	0.00	0	0.00	1	0.85	0	0.00
Spiral Stamp	0	0.00	1	1.85	0	0.00	0	0.00
Curvilinear Stamp	0	0.00	0	0.00	0	0.00	1	1.15
Punctate	6	2.09	0	0.00	0	0.00	0	0.00
Trail + Lin. Stamp	75	26.13	17	31.48	25	21.19	26	29.89
Trail + Punctate	0	0.00	1	1.85	0	0.00	0	0.00
Trail + Over Trail	3	1.05	0	0.00	0	0.00	0	0.00
Over Trail + L.Stamp	1	0.35	0	0.00	0	0.00	0	0.00
TOTAL	287		54		118		87	

Table 41: Frequencies of Rim Section Attributes for Group 2 Sites: Upper Rim Decorative Element (Format 1)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	0	0.00	3	0.77	1	0.57	1	1.00
Trail	65	44.52	215	55.27	72	41.14	36	36.00
Linear Stamp	52	35.62	111	28.53	82	46.86	56	56.00
Punctate	0	0.00	0	0.00	1	0.57	0	0.00
Notch	0	0.00	0	0.00	1	0.57	0	0.00
Over-Trail	1	0.68	0	0.00	0	0.00	0	0.00
Trail + Lin. Stamp	28	19.18	59	15.17	18	10.29	7	7.00
Trail + Over-Trail	0	0.00	1	0.26	0	0.00	0	0.00
TOTAL	146		389		175		100	

Table 42: Frequencies of Rim Section Attributes for Group 1 Sites: Upper Rim Motif (Format 1)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Plain	0	0.00	0	0.00	1	0.85	1	1.15
BAAA11	14	4.88	1	1.85	8	6.78	5	5.75
BAAB11	37	12.89	9	16.67	19	16.10	22	25.29
BAAC11	5	1.74	1	1.85	5	4.24	4	4.60
BABA01	2	0.70	1	1.85	2	1.69	0	0.00
BABA02	4	1.39	1	1.85	6	5.08	2	2.30
BABA03	22	7.67	4	7.41	12	10.17	7	8.05
BABA04	20	6.97	3	5.56	9	7.63	3	3.45
BABA05	10	3.48	2	3.70	3	2.54	2	2.30
BABA06	6	2.09	1	1.85	3	2.54	1	1.15
BABA07	0	0.00	0	0.00	0	0.00	2	2.30
BABA08	3	1.05	0	0.00	0	0.00	0	0.00
BABA09	5	1.74	1	1.85	1	0.85	0	0.00
BABA10	4	1.39	0	0.00	0	0.00	0	0.00
BABA11	5	1.74	0	0.00	1	0.85	0	0.00
BABA12	2	0.70	0	0.00	1	0.85	0	0.00
BABA13	1	0.35	0	0.00	0	0.00	1	1.15
BABA14	4	1.39	0	0.00	0	0.00	0	0.00
BABA15	2	0.70	0	0.00	0	0.00	0	0.00
BABA16	1	0.35	0	0.00	0	0.00	0	0.00
BABA17	2	0.70	0	0.00	0	0.00	0	0.00
BCBC21	2	0.70	0	0.00	0	0.00	0	0.00
BCBD11	1	0.35	0	0.00	0	0.00	0	0.00
BCBD21	3	1.05	0	0.00	0	0.00	0	0.00
CAAA11	0	0.00	0	0.00	1	0.85	0	0.00
CAAA61	1	0.35	0	0.00	0	0.00	0	0.00
CAAA81	5	1.74	0	0.00	0	0.00	0	0.00
CAAC11	0	0.00	2	3.70	0	0.00	0	0.00
CAAC21	1	0.35	1	1.85	1	0.85	0	0.00
CACD31	7	2.44	1	1.85	0	0.00	3	3.45
CACH31	17	5.92	1	1.85	2	1.69	6	6.90
CACL31	1	0.35	1	1.85	1	0.85	0	0.00
DDAA06	2	0.70	0	0.00	0	0.00	0	0.00
DDAC02	0	0.00	0	0.00	1	0.85	0	0.00
DDAC06	2	0.70	0	0.00	0	0.00	2	2.30
DDAC11	2	0.70	1	1.85	1	0.85	0	0.00
DDAC41	1	0.35	0	0.00	0	0.00	0	0.00
DDAC51	1	0.35	0	0.00	0	0.00	0	0.00
DGAC06	0	0.00	0	0.00	1	0.85	0	0.00
DGAE16	1	0.35	0	0.00	0	0.00	0	0.00
DGAF03	0	0.00	0	0.00	2	1.69	0	0.00
DGAF14	1	0.35	0	0.00	0	0.00	0	0.00
EABA01	1	0.35	0	0.00	0	0.00	0	0.00
EBBA01	1	0.35	2	3.70	1	0.85	0	0.00
ECAA11	0	0.00	0	0.00	2	1.69	0	0.00
FAAE11	0	0.00	0	0.00	0	0.00	1	1.15
FAAF11	1	0.35	0	0.00	0	0.00	0	0.00

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Table 42: Frequencies of Rim Section Attributes for Group 1 Sites: (cont.) Upper Rim Motif (Format 1)

ATTRIBUTES	SITES: Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
FABA11	5	1.74	7	12.96	1	0.85	1	1.15
FABA12	2	0.70	0	0.00	1	0.85	2	2.30
FABA13	0	0.00	0	0.00	1	0.85	0	0.00
FABA14	1	0.35	0	0.00	0	0.00	0	0.00
FABA16	1	0.35	0	0.00	0	0.00	0	0.00
FABB11	44	15.33	11	20.37	18	15.25	8	9.20
FABB12	11	3.83	1	1.85	4	3.39	8	9.20
FABB13	1	0.35	0	0.00	2	1.69	3	3.45
FABB14	2	0.70	0	0.00	0	0.00	0	0.00
FABB15	1	0.35	0	0.00	0	0.00	0	0.00
FABC11	7	2.44	0	0.00	3	2.54	0	0.00
FABC13	1	0.35	0	0.00	0	0.00	0	0.00
FABC14	1	0.35	0	0.00	0	0.00	0	0.00
FACD11	0	0.00	0	0.00	1	0.85	0	0.00
FACH11	2	0.70	0	0.00	0	0.00	0	0.00
FADB11	0	0.00	1	1.85	1	0.85	0	0.00
FADB13	0	0.00	0	0.00	0	0.00	1	1.15
IAAH11	0	0.00	1	1.85	0	0.00	0	0.00
IABA11	0	0.00	0	0.00	1	0.85	0	0.00
IABC11	1	0.35	0	0.00	0	0.00	1	1.15
IABC21	3	1.05	0	0.00	0	0.00	0	0.00
IABC61	2	0.70	0	0.00	0	0.00	0	0.00
LJBC06	1	0.35	0	0.00	0	0.00	0	0.00
LJBC63	0	0.00	0	0.00	1	0.85	0	0.00
OAAI03	1	0.35	0	0.00	0	0.00	0	0.00
OACF11	0	0.00	0	0.00	0	0.00	1	1.15
TOTAL	287		54		118		87	

Table 43: Frequencies of Rim Section Attributes for Group 2 Sites: Upper Rim Motif (Format 1)

ATTRIBUTES	SITES: Chypchar N	Chypchar %	Pipeline N	Pipeline %	Campbell N	Campbell %	Milton N	Milton %
Plain	0	0.00	3	0.77	1	0.57	1	1.00
BAAA11	12	8.22	50	12.85	28	16.00	33	33.00
BAAB11	21	14.38	64	16.45	45	25.71	13	13.00
BAAC11	5	3.42	18	4.63	4	2.29	5	5.00
BABA01	0	0.00	3	0.77	0	0.00	0	0.00
BABA02	2	1.37	4	1.03	1	0.57	0	0.00
BABA03	3	2.05	22	5.66	1	0.57	0	0.00
BABA04	17	11.64	11	2.83	5	2.86	0	0.00

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Table 43: Frequencies of Rim Section Attributes for Group 2 Sites (cont.) Upper Rim Motif (Format 1)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
BABA05	7	4.79	14	3.60	5	2.86	2	2.00
BABA06	7	4.79	14	3.60	2	1.14	0	0.00
BABA07	1	0.68	9	2.31	3	1.71	1	1.00
BABA08	3	2.05	9	2.31	4	2.29	0	0.00
BABA09	0	0.00	3	0.77	2	1.14	0	0.00
BABA10	0	0.00	6	1.54	1	0.57	0	0.00
BABA11	0	0.00	2	0.51	0	0.00	0	0.00
BABA12	0	0.00	3	0.77	0	0.00	0	0.00
BABA13	0	0.00	1	0.26	0	0.00	0	0.00
BABA16	0	0.00	1	0.26	0	0.00	0	0.00
BABA21	1	0.68	0	0.00	0	0.00	0	0.00
BCAC21	0	0.00	0	0.00	1	0.57	0	0.00
CAAA06	0	0.00	0	0.00	0	0.00	1	1.00
CAAA11	0	0.00	0	0.00	1	0.57	1	1.00
CAAB71	0	0.00	1	0.26	0	0.00	0	0.00
CAAC11	0	0.00	0	0.00	2	1.14	0	0.00
CAAC21	0	0.00	1	0.26	0	0.00	1	1.00
CAAC31	1	0.68	3	0.77	0	0.00	0	0.00
CAAC61	0	0.00	2	0.51	0	0.00	0	0.00
CABA31	1	0.68	0	0.00	0	0.00	0	0.00
CABB13	1	0.68	0	0.00	0	0.00	0	0.00
CABB22	1	0.68	0	0.00	0	0.00	0	0.00
CABC31	1	0.68	0	0.00	0	0.00	0	0.00
CACD31	13	8.90	52	13.37	3	1.71	6	6.00
CACH31	7	4.79	30	7.71	7	4.00	1	1.00
CACL31	2	1.37	5	1.29	1	0.57	0	0.00
DAAA11	0	0.00	0	0.00	0	0.00	1	1.00
DAAB11	0	0.00	0	0.00	0	0.00	2	2.00
DAAD06	0	0.00	0	0.00	1	0.57	1	1.00
DAAD21	0	0.00	1	0.26	0	0.00	2	2.00
DAAD31	0	0.00	1	0.26	0	0.00	0	0.00
DAAD71	0	0.00	0	0.00	1	0.57	0	0.00
DAAE06	1	0.68	0	0.00	1	0.57	0	0.00
DAAE11	0	0.00	1	0.26	0	0.00	0	0.00
DAAF06	0	0.00	1	0.26	1	0.57	0	0.00
DAAF11	1	0.68	0	0.00	0	0.00	0	0.00
DDAA06	1	0.68	0	0.00	1	0.57	0	0.00
DDAA07	1	0.68	0	0.00	0	0.00	2	2.00
DDAA21	0	0.00	0	0.00	1	0.57	0	0.00
DDAA31	0	0.00	0	0.00	1	0.57	0	0.00
DDAC06	0	0.00	7	1.80	9	5.14	8	8.00
DDAC07	0	0.00	0	0.00	4	2.29	2	2.00
DDAC11	2	1.37	0	0.00	8	4.57	1	1.00
DDAC31	0	0.00	0	0.00	1	0.57	2	2.00
DDAC41	3	2.05	0	0.00	0	0.00	0	0.00
DDAD11	0	0.00	0	0.00	0	0.00	1	1.00
DGAA03	1	0.68	0	0.00	0	0.00	0	0.00

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Table 43: Frequencies of Rim Section Attributes for Group 2 Sites:
(cont.) Upper Rim Motif (Format 1)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
DGAA11	0	0.00	0	0.00	1	0.57	2	2.00
DGAA12	0	0.00	1	0.26	0	0.00	0	0.00
DGAA13	1	0.68	0	0.00	0	0.00	0	0.00
DGAA14	0	0.00	1	0.26	1	0.57	0	0.00
DGAA15	1	0.68	0	0.00	0	0.00	0	0.00
DGAA16	1	0.68	0	0.00	0	0.00	0	0.00
DGAA17	1	0.68	0	0.00	0	0.00	0	0.00
DGAB15	1	0.68	0	0.00	0	0.00	0	0.00
DGAB18	1	0.68	0	0.00	0	0.00	0	0.00
DGAC06	0	0.00	0	0.00	0	0.00	1	1.00
DGAC11	0	0.00	0	0.00	0	0.00	1	1.00
DGAF11	0	0.00	0	0.00	1	0.57	0	0.00
DSCS11	0	0.00	0	0.00	1	0.57	0	0.00
EAAA11	0	0.00	0	0.00	0	0.00	1	1.00
EAAB11	1	0.68	0	0.00	0	0.00	0	0.00
EABA05	0	0.00	0	0.00	0	0.00	1	1.00
EBBA01	0	0.00	0	0.00	0	0.00	1	1.00
EBBA03	1	0.68	0	0.00	0	0.00	0	0.00
FAAF11	1	0.68	0	0.00	0	0.00	0	0.00
FABA11	6	4.11	7	1.80	4	2.29	0	0.00
FABA12	1	0.68	2	0.51	1	0.57	0	0.00
FABA13	0	0.00	1	0.26	2	1.14	1	1.00
FABB11	2	1.37	14	3.60	1	0.57	2	2.00
FABB12	2	1.37	7	1.80	2	1.14	0	0.00
FABB13	3	2.05	6	1.54	1	0.57	0	0.00
FABB14	0	0.00	1	0.26	1	0.57	0	0.00
FABC11	1	0.68	3	0.77	1	0.57	1	1.00
FABC12	0	0.00	0	0.00	1	0.57	0	0.00
FADA16	0	0.00	1	0.26	0	0.00	0	0.00
FADB13	1	0.68	0	0.00	0	0.00	0	0.00
IABC11	1	0.68	1	0.26	1	0.57	0	0.00
IABC31	1	0.68	0	0.00	0	0.00	0	0.00
IABC71	0	0.00	1	0.26	0	0.00	0	0.00
LABC06	0	0.00	0	0.00	1	0.57	0	0.00
LABD06	0	0.00	0	0.00	1	0.57	0	0.00
LABD11	1	0.68	0	0.00	1	0.57	0	0.00
LABD21	0	0.00	0	0.00	1	0.57	0	0.00
LABD22	1	0.68	0	0.00	0	0.00	0	0.00
LABD31	0	0.00	0	0.00	1	0.57	0	0.00
LABD61	0	0.00	0	0.00	1	0.57	2	2.00
LABD71	0	0.00	0	0.00	2	1.14	0	0.00
LJBC06	0	0.00	0	0.00	1	0.57	0	0.00
LJBC11	0	0.00	1	0.26	0	0.00	0	0.00
LJBD01	0	0.00	0	0.00	1	0.57	0	0.00
OACI03	1	0.68	0	0.00	0	0.00	0	0.00
TOTAL	146		389		175		100	

Table 44: Frequencies of Rim Section Attributes for Group 1 Sites: Secondary Rim Motif (Format 1)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Plain	247	86.06	49	90.74	100	84.75	80	91.95
BACD01	1	0.35	0	0.00	0	0.00	0	0.00
BCAB01	0	0.00	0	0.00	0	0.00	1	1.15
BCBD01	2	0.70	0	0.00	0	0.00	0	0.00
EAAA12	0	0.00	1	1.85	0	0.00	0	0.00
EAAB11	0	0.00	1	1.85	0	0.00	0	0.00
EAAB12	0	0.00	0	0.00	6	5.08	0	0.00
EBAB12	0	0.00	0	0.00	1	0.85	0	0.00
EBCD11	1	0.35	0	0.00	0	0.00	0	0.00
EGAD11	0	0.00	0	0.00	0	0.00	1	1.15
EGBD04	1	0.35	0	0.00	0	0.00	0	0.00
EGBD11	0	0.00	0	0.00	0	0.00	1	1.15
EGBD21	17	5.92	2	3.70	7	5.93	3	3.45
EGBD31	10	3.48	0	0.00	0	0.00	0	0.00
EHBD11	1	0.35	0	0.00	2	1.69	0	0.00
EHBD21	3	1.05	1	1.85	0	0.00	0	0.00
EHBD31	0	0.00	0	0.00	0	0.00	1	1.15
EHBD41	1	0.35	0	0.00	0	0.00	0	0.00
FIBP11	1	0.35	0	0.00	2	1.69	0	0.00
FIBP36	1	0.35	0	0.00	0	0.00	0	0.00
FIBP41	1	0.35	0	0.00	0	0.00	0	0.00
TOTAL	287		54		118		87	

Table 45: Frequencies of Rim Section Attributes for Group 2 Sites: Secondary Rim Motif (Format 1)

ATTRIBUTES	SITES Chypchar N	Chypchar %	Pipeline N	Pipeline %	Campbell N	Campbell %	Milton N	Milton %
Plain	125	85.62	357	91.77	150	85.71	94	94.00
BACD01	1	0.68	1	0.26	0	0.00	0	0.00
BCBC26	1	0.68	0	0.00	0	0.00	1	1.00
BCBC31	0	0.00	0	0.00	1	0.57	1	1.00
BCBC46	1	0.68	0	0.00	0	0.00	0	0.00
BCBC56	2	1.37	2	0.51	6	3.43	2	2.00
BCBC61	0	0.00	1	0.26	0	0.00	0	0.00
EAAB12	0	0.00	2	0.51	2	1.14	0	0.00
EAAC12	1	0.68	1	0.26	0	0.00	0	0.00
EBAB12	0	0.00	0	0.00	0	0.00	1	1.00
EBCD11	2	1.37	8	2.06	0	0.00	0	0.00
EGBD11	1	0.68	3	0.77	1	0.57	0	0.00

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Table 45: Frequencies of Rim Section Attributes for Group 2 Sites: (cont.) Secondary Rim Motif (Format 1)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
EGBD21	1	0.68	7	1.80	2	1.14	0	0.00
EGBD31	2	1.37	0	0.00	0	0.00	0	0.00
EHAD11	1	0.68	1	0.26	1	0.57	0	0.00
EHBD11	1	0.68	0	0.00	0	0.00	0	0.00
EHBD21	4	2.83	0	0.00	4	2.29	1	1.00
EHBD31	0	0.00	0	0.00	1	0.57	0	0.00
FAAI11	0	0.00	0	0.00	1	0.57	0	0.00
FIBP11	0	0.00	1	0.26	0	0.00	0	0.00
FIBP16	0	0.00	0	0.00	1	0.57	0	0.00
FIBP31	1	0.68	1	0.26	1	0.57	0	0.00
FIBP36	1	0.68	0	0.00	4	2.29	0	0.00
FIBP41	1	0.68	4	1.03	0	0.00	0	0.00
TOTAL	146		389		175		100	

Table 46: Frequencies of Rim Section Attributes for Group 1 Sites: Neck Decorative Element (Format 1)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	115	40.07	18	33.33	43	36.44	34	39.08
Trail	154	53.66	31	57.41	57	48.31	46	52.87
Linear Stamp	11	3.83	1	1.85	13	11.02	5	5.75
Dentate Stamp	0	0.00	0	0.00	1	0.85	0	0.00
Spiral Stamp	0	0.00	1	1.85	0	0.00	0	0.00
Over Trail	2	0.70	0	0.00	1	0.85	0	0.00
Trail + Lin. Stamp	3	1.05	3	5.56	3	2.54	2	2.30
Trail + Over Trail	2	0.70	0	0.00	0	0.00	0	0.00
TOTAL	287		54		118		87	

Table 47: Frequencies of Rim Section Attributes for Group 2 Sites: Neck Decorative Element (Format 1)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	96	65.75	218	56.04	65	37.14	50	50.00
Trail	43	29.45	166	42.67	102	58.29	45	45.00
Linear Stamp	6	4.11	3	0.77	8	4.57	4	4.00
Punctate	1	0.68	0	0.00	0	0.00	1	1.00
Over-Trail	0	0.00	1	0.26	0	0.00	0	0.00
Trail + Lin. Stamp	0	0.00	1	0.26	0	0.00	0	0.00
TOTAL	146		389		175		100	

Table 48: Frequencies of Rim Section Attributes for Group 1 Sites: Neck Motif (Format 1)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	115	40.07	18	33.33	43	36.44	34	39.08
BAAB02	2	0.70	0	0.00	2	1.69	0	0.00
BAAB11	1	0.35	0	0.00	3	2.54	0	0.00
BABA02	0	0.00	0	0.00	2	1.69	1	1.15
BABA03	1	0.35	0	0.00	3	2.54	0	0.00
BABA04	6	2.09	1	1.85	4	3.39	1	1.15
BABA05	4	1.39	0	0.00	0	0.00	1	1.15
BABA06	1	0.35	0	0.00	0	0.00	1	1.15
BABA08	0	0.00	0	0.00	1	0.85	0	0.00
BABA09	0	0.00	0	0.00	1	0.85	0	0.00
BABA92	74	25.78	15	27.78	18	15.25	30	34.48
DAAB11	1	0.35	0	0.00	0	0.00	1	1.15
DDAC02	3	1.05	0	0.00	0	0.00	0	0.00
DDAC11	0	0.00	0	0.00	1	0.85	1	1.15
DDAC21	1	0.35	0	0.00	1	0.85	0	0.00
DDAD11	1	0.35	0	0.00	0	0.00	0	0.00
DGAB06	0	0.00	0	0.00	1	0.85	0	0.00
DGAF01	1	0.35	0	0.00	0	0.00	0	0.00
EAAA11	0	0.00	0	0.00	2	1.69	0	0.00
EAAB11	0	0.00	0	0.00	6	5.08	3	3.45
EAAC11	0	0.00	1	1.85	0	0.00	1	1.15
EABA01	18	6.27	1	1.85	3	2.54	3	3.45
EABA02	17	5.92	3	5.56	4	3.39	2	2.30
EABA03	17	5.92	6	11.11	8	6.78	1	1.15
EABA04	16	5.57	1	1.85	8	6.78	1	1.15
EABA05	4	1.39	0	0.00	0	0.00	2	2.30
EABA06	1	0.35	0	0.00	0	0.00	0	0.00
EABA12	0	0.00	0	0.00	0	0.00	1	1.15

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Table 48: Frequencies of Rim Section Attributes for Group 1 Sites: (cont.) Neck Motif (Format 1)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
EABA14	0	0.00	1	1.85	0	0.00	0	0.00
EBABO2	0	0.00	0	0.00	1	0.85	0	0.00
EBAB12	0	0.00	1	1.85	0	0.00	0	0.00
EBBA92	0	0.00	1	1.85	0	0.00	0	0.00
FAAD11	0	0.00	0	0.00	1	0.85	0	0.00
FABC13	1	0.35	0	0.00	1	0.85	0	0.00
FADA11	0	0.00	0	0.00	1	0.85	1	1.15
FADBO2	1	0.35	0	0.00	1	0.85	0	0.00
FADB11	0	0.00	0	0.00	1	0.85	0	0.00
FADB12	0	0.00	2	3.70	0	0.00	1	1.15
FADB13	0	0.00	0	0.00	1	0.85	0	0.00
FADB15	0	0.00	1	1.85	0	0.00	0	0.00
FADB16	0	0.00	1	1.85	0	0.00	0	0.00
HDDCO2	1	0.35	0	0.00	0	0.00	1	1.15
IABC92	0	0.00	1	1.85	0	0.00	0	0.00
TOTAL	287		54		118		87	

Table 49: Frequencies of Rim Section Attributes for Group 2 Sites: Neck Motif (Format 1)

ATTRIBUTES	SITES Chypchar N	Chypchar %	Pipeline N	Pipeline %	Campbell N	Campbell %	Milton N	Milton %
Plain	96	65.75	218	56.04	65	37.14	50	50.00
BAABO2	0	0.00	0	0.00	1	0.57	3	3.00
BAABO3	0	0.00	0	0.00	0	0.00	1	1.00
BAAB11	2	1.37	1	0.26	0	0.00	2	2.00
BAAC11	1	0.68	0	0.00	0	0.00	0	0.00
BABAO2	0	0.00	0	0.00	1	0.57	0	0.00
BABAO3	0	0.00	0	0.00	3	1.71	0	0.00
BABAO4	0	0.00	2	0.51	5	2.86	0	0.00
BABAO5	0	0.00	2	0.51	3	1.71	1	1.00
BABAO6	0	0.00	1	0.26	3	1.71	1	1.00
BABAO7	0	0.00	1	0.26	1	0.57	0	0.00
BABAO8	0	0.00	0	0.00	1	0.57	0	0.00
BABA92	13	8.90	71	18.25	54	30.86	31	31.00
BACB92	0	0.00	0	0.00	1	0.57	0	0.00
BCACO2	0	0.00	0	0.00	0	0.00	1	1.00
BCBDO2	1	0.68	0	0.00	0	0.00	0	0.00
DAAC11	0	0.00	2	0.51	0	0.00	0	0.00
DDACOO	1	0.68	0	0.00	1	0.57	0	0.00
DDACO2	0	0.00	0	0.00	0	0.00	1	1.00

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Table 49: Frequencies of Rim Section Attributes for Group 2 Sites: (cont.) Neck Motif (Format 1)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
DDAC06	0	0.00	3	0.77	0	0.00	0	0.00
DDAC07	0	0.00	1	0.26	0	0.00	0	0.00
DDAC11	0	0.00	0	0.00	1	0.57	0	0.00
DDAC12	0	0.00	1	0.26	0	0.00	0	0.00
DDAC21	0	0.00	0	0.00	1	0.57	0	0.00
EAAA11	1	0.68	0	0.00	0	0.00	0	0.00
EAAB11	3	2.05	1	0.26	4	2.29	2	2.00
EABA01	8	5.48	19	4.88	3	1.71	1	1.00
EABA02	11	7.53	20	5.14	2	1.14	1	1.00
EABA03	7	4.79	31	7.97	11	6.29	2	2.00
EABA04	0	0.00	8	2.06	4	2.29	2	2.00
EABA05	0	0.00	4	1.03	4	2.29	1	1.00
EABA06	1	0.68	0	0.00	0	0.00	0	0.00
ECAB11	0	0.00	0	0.00	1	0.57	0	0.00
FADB11	0	0.00	1	0.26	0	0.00	0	0.00
FADB12	0	0.00	1	0.26	0	0.00	0	0.00
FADB13	0	0.00	0	0.00	2	1.14	0	0.00
FADB14	0	0.00	0	0.00	1	0.57	0	0.00
FADC02	1	0.68	0	0.00	0	0.00	0	0.00
FADC13	0	0.00	1	0.26	0	0.00	0	0.00
HDDA02	0	0.00	0	0.00	1	0.57	0	0.00
HDDC24	0	0.00	0	0.00	1	0.57	0	0.00
TOTAL	146		389		175		100	

Table 50: Frequencies of Rim Section Attributes for Group 1 Sites: Secondary Neck Motif (Format 1)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	64	30.92	22	56.41	42	44.68	31	54.39
BCBC11	0	0.00	0	0.00	1	1.06	0	0.00
EAAA11	1	0.48	0	0.00	0	0.00	0	0.00
EAAA12	2	0.97	0	0.00	0	0.00	0	0.00
EAAB11	0	0.00	2	5.13	0	0.00	0	0.00
EAAB12	2	0.97	3	7.69	7	7.45	3	5.26
EACD11	0	0.00	0	0.00	2	2.13	5	8.77
EBAA12	0	0.00	0	0.00	0	0.00	1	1.75
EBAB02	0	0.00	0	0.00	5	5.32	0	0.00
EBAB12	2	0.97	2	5.13	4	4.26	0	0.00
EBAC02	0	0.00	0	0.00	2	2.13	0	0.00
EBAC12	2	0.97	1	2.56	0	0.00	0	0.00

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Table 50: Frequencies of Rim Section Attributes for Group 1 Sites:
(cont.) Secondary Neck Motif (Format 1)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
EBCD11	0	0.00	1	2.56	0	0.00	0	0.00
EGAC11	0	0.00	0	0.00	0	0.00	1	1.75
EGAD11	1	0.48	1	2.56	1	1.06	0	0.00
EGAD21	0	0.00	0	0.00	0	0.00	1	1.75
EGBD11	15	7.25	1	2.56	2	2.13	0	0.00
EGBD21	43	20.77	2	5.13	16	17.02	7	12.28
EGBD31	15	7.25	0	0.00	0	0.00	0	0.00
EHBD11	3	1.45	1	2.56	0	0.00	1	1.75
EHBD21	48	23.19	2	5.13	12	12.77	6	10.53
EHBD31	9	4.35	1	2.56	0	0.00	1	1.75
TOTAL	207		39		94		57	

Table 51: Frequencies of Rim Section Attributes for Group 2 Sites:
Secondary Neck Motif (Format 1)

ATTRIBUTES	SITES Chypchar N	Chypchar %	Pipeline N	Pipeline %	Campbell N	Campbell %	Milton N	Milton %
Plain	77	57.46	196	60.87	75	64.66	49	79.03
DAAB11	0	0.00	2	0.62	0	0.00	0	0.00
DAAC11	1	0.75	0	0.00	0	0.00	0	0.00
EAAA12	0	0.00	0	0.00	1	0.86	0	0.00
EAAB11	0	0.00	2	0.62	0	0.00	0	0.00
EAAB12	0	0.00	5	1.55	0	0.00	1	1.61
EAAC12	1	0.75	0	0.00	1	0.86	0	0.00
EACD11	3	2.24	1	0.31	0	0.00	0	0.00
EBAB12	0	0.00	0	0.00	3	2.59	1	1.61
EBCD11	1	0.75	0	0.00	0	0.00	0	0.00
EGAD11	0	0.00	0	0.00	1	0.86	2	3.23
EGBD11	5	3.73	11	3.42	1	0.86	0	0.00
EGBD21	28	20.90	57	17.70	13	11.21	2	3.23
EGBD31	7	5.22	4	1.24	1	0.86	3	4.84
EGBD41	1	0.75	6	1.86	0	0.00	0	0.00
EGCD11	1	0.75	0	0.00	0	0.00	0	0.00
EHAD11	0	0.00	0	0.00	1	0.86	1	1.61
EHBD11	2	1.49	2	0.62	3	2.59	0	0.00
EHBD21	7	5.22	32	9.94	16	13.79	3	4.84
EHBD31	0	0.00	4	1.24	0	0.00	0	0.00
TOTAL	134		322		116		62	

Table 52: Frequencies of Bowl Section Attributes for Group 1 Sites: Exterior Bowl Orientation (Format 1)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Bulbous	3	2.68	0	0.00	0	0.00	0	0.00
Insloping	0	0.00	1	6.25	1	3.57	0	0.00
Vertical	30	26.79	5	31.25	10	35.71	3	12.00
Outflaring	79	70.54	10	62.50	17	60.71	22	88.00
TOTAL	112		16		28		25	

Table 53: Frequencies of Bowl Section Attributes for Group 2 Sites: Exterior Bowl Orientation (Format 1)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Bulbous	0	0.00	2	2.8	2	6.45	5	26.32
Insloping	0	0.00	0	0.0	1	3.23	0	0.00
Vertical	9	13.04	11	15.7	3	9.68	4	21.05
Outflaring	60	86.96	57	81.4	25	80.65	10	52.63
TOTAL	69		70		31		19	

Table 54: Frequencies of Bowl Section Attributes for Group 1 Sites: Exterior Bowl Profile (Format 1)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Straight	40	35.71	6	37.50	13	46.43	4	16.00
Concave	1	0.89	0	0.00	0	0.00	0	0.00
Extra Concave	3	2.68	0	0.00	0	0.00	0	0.00
Convex	40	35.71	5	31.25	11	39.29	17	68.00
Extra Convex	28	25.00	5	31.25	4	14.29	4	16.00
TOTAL	112		16		28		25	

Table 55: Frequencies of Bowl Section Attributes for Group 2 Sites: Exterior Bowl Profile (Format 1)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Straight	10	14.49	15	21.43	1	3.23	3	15.79
Concave	4	5.80	4	5.71	0	0.00	0	0.00
Extra Concave	44	63.77	41	58.57	23	74.19	8	42.11
Convex	7	10.14	8	11.43	5	16.13	5	26.32
Extra Convex	4	5.80	2	2.86	2	6.45	3	15.79
TOTAL	69		70		31		19	

Table 56: Frequencies of Bowl Section Attributes for Group 1 Sites: Interior Bowl Profile (Format 1)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Straight	36	32.43	7	43.75	9	32.14	7	28.00
Concave	1	0.90	0	0.00	0	0.00	0	0.00
Extra Concave	0	0.00	0	0.00	0	0.00	1	4.00
Convex	22	19.82	4	25.00	6	21.43	2	8.00
Extra Convex	52	46.85	5	31.25	13	46.43	15	60.00
TOTAL	111		16		28		25	

Table 57: Frequencies of Bowl Section Attributes for Group 2 Sites: Interior Bowl Profile (Format 1)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Straight	10	14.49	12	17.14	4	12.90	6	31.58
Extra Concave	1	1.45	0	0.00	0	0.00	0	0.00
Convex	17	24.64	17	24.29	1	3.23	1	5.26
Extra Convex	41	59.42	41	58.57	26	83.87	12	63.16
TOTAL	69		70		31		19	

Table 58: Frequencies of Bowl Section Attributes for Group 1 Sites: Angle of Lip to Interior (Format 1)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Acute	4	3.67	0	0.00	2	7.14	4	17.39
Straight	11	10.09	4	25.00	6	21.43	4	17.39
Obtuse	94	86.24	12	75.00	20	71.43	15	65.22
TOTAL	109		16		28		23	

Table 59: Frequencies of Bowl Section Attributes for Group 2 Sites: Angle of Lip to Interior (Format 1)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Acute	1	1.45	1	1.43	0	0.00	4	21.05
Right	3	4.35	12	17.14	5	19.23	6	31.58
Obtuse	65	94.20	57	81.43	21	80.77	9	47.37
TOTAL	69		70		26		19	

Table 60: Frequencies of Bowl Section Attributes for Group 1 Sites: Lip Thickness (Format 1)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
1 mm.	5	4.55	0	0.00	0	0.00	0	0.00
2 mm.	7	6.36	0	0.00	4	14.29	6	26.09
3 mm.	18	16.36	1	6.67	7	25.00	5	21.74
4 mm.	34	30.91	8	53.33	5	17.86	4	17.39
5 mm.	17	15.45	3	20.00	2	7.14	2	8.70
6 mm.	7	6.36	2	13.33	1	3.57	3	13.04
7 mm.	3	2.73	0	0.00	1	3.57	0	0.00
8 mm.	8	7.27	0	0.00	4	14.29	1	4.35
9 mm.	1	0.91	1	6.67	2	7.14	1	4,35
10 mm.	3	2.73	0	0.00	1	3.57	0	0.00
11 mm.	2	1.82	0	0.00	0	0.00	1	4.35
12 mm.	2	1.82	0	0.00	0	0.00	0	0.00
15 mm.	1	0.91	0	0.00	0	0.00	0	0.00
16 mm.	1	0.91	0	0.00	1	3.57	0	0.00
17 mm.	1	0.91	0	0.00	0	0.00	0	0.00
TOTAL	110		15		28		23	

Table 61: Frequencies of Bowl Section Attributes for Group 2 Sites: Lip Thickness (Format 1)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
1 mm.	0	0.00	0	0.00	0	0.00	4	21.05
2 mm.	5	7.25	0	0.00	0	0.00	5	26.32
3 mm.	6	8.70	14	20.00	9	30.00	0	0.00
4 mm.	27	39.13	31	44.29	13	43.33	7	36.84
5 mm.	21	30.43	15	21.43	6	20.00	1	5.26
6 mm.	6	8.70	9	12.86	1	3.33	2	10.53
7 mm.	3	4.35	1	1.43	1	3.33	0	0.00
8 mm.	1	1.45	0	0.00	0	0.00	0	0.00
TOTAL	69		70		30		19	

Table 62: Frequencies of Bowl Section Attributes for Group 1 Sites: Bowl Decorative Element (Format 1)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	48	42.86	11	68.75	11	80	10	40.00
Trail	60	53.57	3	18.75	17	95	15	60.00
Punctate	3	2.68	2	12.50	0	5	0	0.00
Over-Trail	1	0.89	0	0.00	0	1	0	0.00
TOTAL	112		16		28		25	

Table 63: Frequencies of Bowl Section Attributes for Group 2 Sites: Bowl Decorative Element (Format 1)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	57	82.61	42	60.00	21	67.74	11	57.89
Trail	12	17.39	28	40.00	10	32.26	8	42.11
TOTAL	69		70		31		19	

Table 64: Frequencies of Bowl Section Attributes for Group 1 Sites: Bowl Motif (Format 1)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Plain	48	42.86	11	68.75	11	39.29	10	40.00
BABA01	2	1.79	0	0.00	0	0.00	0	0.00
BABA02	1	0.89	0	0.00	1	3.57	0	0.00
BABA03	1	0.89	0	0.00	2	7.14	0	0.00
BABA04	1	0.89	0	0.00	3	10.71	0	0.00
BABA05	3	2.68	0	0.00	1	3.57	0	0.00
BABA06	2	1.79	1	6.25	1	3.57	0	0.00
BABA07	0	0.00	0	0.00	1	3.57	0	0.00
BABA08	1	0.89	0	0.00	1	3.57	0	0.00
BABA10	1	0.89	0	0.00	0	0.00	0	0.00
BABA11	3	2.68	0	0.00	1	3.57	0	0.00
BABA12	2	1.79	0	0.00	0	0.00	0	0.00
BABA13	2	1.79	0	0.00	1	3.57	0	0.00
BABA14	3	2.68	0	0.00	0	0.00	1	4.00
BABA15	1	0.89	0	0.00	0	0.00	0	0.00
BABA16	0	0.00	0	0.00	0	0.00	1	4.00
BABA17	1	0.89	0	0.00	0	0.00	0	0.00
BABA21	0	0.00	0	0.00	0	0.00	1	4.00
BABA26	1	0.89	0	0.00	0	0.00	0	0.00
BABA92	22	19.64	2	12.50	4	14.29	5	20.00
BCAA11	1	0.89	0	0.00	0	0.00	0	0.00
BCAD02	0	0.00	1	6.25	0	0.00	0	0.00
BCAD03	0	0.00	1	6.25	0	0.00	0	0.00
BCBA11	1	0.89	0	0.00	0	0.00	0	0.00
BCBD15	1	0.89	0	0.00	0	0.00	0	0.00
DDAC06	0	0.00	0	0.00	0	0.00	1	4.00
DDAC11	1	0.89	0	0.00	0	0.00	0	0.00
DDAC12	1	0.89	0	0.00	0	0.00	0	0.00
DGAA11	1	0.89	0	0.00	1	3.57	0	0.00
FADA05	1	0.89	0	0.00	0	0.00	1	4.00
HDDA11	0	0.00	0	0.00	0	0.00	1	4.00
HDDC11	4	3.57	0	0.00	0	0.00	3	12.00
HDDC12	1	0.89	0	0.00	0	0.00	0	0.00
HDDC13	1	0.89	0	0.00	0	0.00	0	0.00
HDDC21	2	1.79	0	0.00	0	0.00	0	0.00
HDDC22	2	1.79	0	0.00	0	0.00	0	0.00
LABD26	0	0.00	0	0.00	0	0.00	1	4.00
TOTAL	112		16		28		25	

Table 65: Frequencies of Bowl Section Attributes for Group 2 Sites: Bowl Motif (Format 1)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	57	82.61	42	60.00	21	67.74	11	57.89
BABA01	0	0.00	1	1.43	0	0.00	0	0.00
BABA02	1	1.45	2	2.86	2	6.45	0	0.00
BABA03	2	2.90	7	10.00	1	3.23	7	36.84
BABA04	4	5.80	9	12.86	2	6.45	0	0.00
BABA05	3	4.35	4	5.71	2	6.45	0	0.00
BABA06	0	0.00	4	5.71	0	0.00	0	0.00
BABA92	2	2.90	0	0.00	2	6.45	1	5.26
DDAC11	0	0.00	0	0.00	1	3.23	0	0.00
HDDC01	0	0.00	1	1.43	0	0.00	0	0.00
TOTAL	69		70		31		19	

Table 66: Frequencies of Bowl Section Attributes for Group 1 Sites: Secondary Bowl Motif (Format 1)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	69	74.19	13	92.86	12	50.00	13	72.22
EHAD11	14	15.05	0	0.00	5	20.83	4	22.22
EHBD11	8	8.60	1	7.14	7	29.17	1	5.56
EHBD31	1	1.08	0	0.00	0	0.00	0	0.00
EHBD41	1	1.08	0	0.00	0	0.00	0	0.00
TOTAL	93		14		24		18	

Table 67: Frequencies of Bowl Section Attributes for Group 2 Sites: Secondary Bowl Motif (Format 1)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	63	94.03	53	76.81	27	93.10	18	100.00
BCAC11	0	0.00	1	1.45	0	0.00	0	0.00
BCAD03	0	0.00	1	1.45	0	0.00	0	0.00
EHAD11	4	5.97	14	20.29	2	6.90	0	0.00
TOTAL	67		69		29		18	

The values of some of the variables were then systematically translated into successively more inclusive (lumped) formats. Of the nominal variables of rim and bowl section shape, only the values of exterior and exterior profile variables were lumped by translating the 'concave', and 'extra concave' values to simply 'concave', and 'convex' and 'extra convex' to simply 'convex', thereby producing Format 2 (recoded). The interval scale variables of rim and bowl section variables were lumped by increasing the size of the interval used to measure from one mm. to two mm. in the case of rim section lip thickness, from one mm. to five mm. in the case of collar height, collar thickness at base, and bowl section lip thickness, and from 10 mm. to 50 mm. in the case of rim diameter at lip. These more inclusive formats for the metric variables are referred to as Format 2. The translations effectively changed the interval variables to ordinal variables. The values of rim and bowl section interval variables were lumped for sampling reasons. The ceramic artifacts under analysis were hand-made, and because of this are subject to some variability in collar height, bowl lip thickness, etc. The intervals employed in the measurement of these aspects of the pots and pipes, centimetres for rim section diameter at lip and millimetres for the others, are quite small. Because only one observation per artifact was taken, and this observation was treated as a mean measurement even though the fragment measured may represent a small percentage of the original whole artifact, there is a chance that skewing of the measurement could occur. For example, let us examine a hypothetical vessel with a collar that varies in height between 15 and 20 mm. and with a mean collar height of 17.5. If the surviving rim section came from a portion of the vessel where the collar was only 15 mm. high the measurement, treated as a mean, would certainly be skewed

away from the actual mean of 17.5 mm. This possibility of sample error decreases as the interval employed increased. Therefore, lumping of interval values into larger units would serve as a comparative check on the pattern exhibited by the smaller intervals. Taking the same hypothetical pot as an example, if the interval was increased to five mm. instead of one, the observed measurement (15 mm.) would fall into the same interval (15 - 20 mm.) as the mean collar height (17.5 mm.).

Lumping of the variables of rim and bowl section decoration was treated in a somewhat different manner. The values of the nominal variables of decorative element were regrouped into categories that were deemed to be consistent with internal similarity. For example, the elements Single Furrow and Double Furrow both share the common trait of being furrows, and were lumped accordingly into Furrow. Linear Stamp, Dentate Stamp, and Spiral Stamp all share the characteristic of being impressed elements, and were combined into one value termed Stamp. The values Punctate and Notch were also lumped together as Punctate. The recoding was carried over into the values that consisted of combinations of more than one element; all of these were reduced to Furrow + Stamp. The recoded elements were designated Format 2.

The initial recoding of motifs was more complicated because of the large amount of variation of decoration that was evident in the first sample. The first step was to eliminate obviously inessential values. A number of motifs were deemed inessential because they occurred at one site only. Many of these motifs could be recoded as a similar more common motif. For example, in the case of interior rim and lip decoration, motifs that had been recorded with regard to positioning were simply translated to motif designations that disregarded the position of

the decoration (e.g.'EGBD21' was changed to 'BCBD21'). Other motifs were too idiosyncratic to deal with in this manner, and were excluded from further examination when upper rim motif and/or neck motif were under consideration, either separately or in combination. These were dropped from the sample entirely. They included the following: 'BCAC21' (one from Campbell), 'BCBC21' (two from Rife), 'BCBD11' (one from Rife), 'BCBD21' (two from Rife), 'DSCS11' (one from Campbell), 'IAAH11' (one from Unick), 'OAAI03' (one from Rife), 'OACF11' (one from Van Eden), and 'OACI03' (one from Chypchar) for upper rim motif; and 'IABC92' (one from Unick) for neck motif.

The next step involved lumping the motif values into successively more inclusive formats. This was a relatively simple procedure because the motif taxonomy was specifically designed to accommodate this process. The successively more inclusive categories correspond to the taxonomic levels described in Section 5.2. To continue the biological analogy for the taxonomy, the Format 2 motif format correspond to a classification at the level of 'species', Format 3 to 'genus', Format 4 to 'family', and Format 5 to 'order'. These successive levels of the taxonomy preserve, and even enhance, the ordinal nature of the variables. A further most inclusive format was also generated, that of presence or absence of decoration for all but upper rim motif, and was termed Format 6. Upper rim motif was excluded from Format 6 because over 99% of the sample had decoration on the upper rim. The frequencies and percentages of the revised data from Format 2 to Format 6 are presented in Tables 68 - 141 for the rim section variables, and Tables 142 - 167 for the bowl section variables. Tables 12 - 167, therefore represent the analytical univariate data base examined in this dissertation.

Table 68: Frequencies of Rim Section Attributes for Group 1 Sites: Exterior Rim Profile (Format 2)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Straight	118	41.11	25	46.30	47	39.83	45	51.72
Concave	31	10.80	10	18.52	10	8.47	11	12.64
Convex	138	48.08	19	35.19	61	51.69	31	35.63
TOTAL	287		54		118		87	

Table 69: Frequencies of Rim Section Attributes for Group 2 Sites: Exterior Rim Profile (Format 2)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Straight	63	43.15	195	50.13	78	44.57	49	49.00
Concave	30	20.55	101	25.96	32	18.29	16	16.00
Convex	53	36.30	93	23.91	65	37.14	35	35.00
TOTAL	146		389		175		100	

Table 70: Frequencies of Rim Section Attributes for Group 1 Sites: Interior Rim Profile (Format 2)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Straight	74	25.96	20	37.74	33	27.97	26	30.95
Concave	185	64.91	31	58.49	75	63.56	50	59.52
Convex	26	9.12	2	3.77	10	8.47	8	9.52
TOTAL	285		53		118		84	

Table 71: Frequencies of Rim Section Attributes for Group 2 Sites: Interior Rim Profile (Format 2)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Straight	42	28.77	127	32.99	59	34.50	30	31.25
Concave	89	60.96	188	48.83	68	39.77	58	60.42
Convex	15	10.27	70	18.18	44	25.73	8	8.33
	146		385		171		96	

Table 72: Frequencies of Rim Section Attributes for Group 1 Sites: Collar Height (Format 2)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
1-5 mm.	1	0.40	0	0.00	0	0.00	0	0.00
6-10 mm.	11	4.42	3	6.67	13	12.26	7	9.59
11-15 mm.	38	15.26	19	42.22	42	39.62	20	27.40
16-20 mm.	61	24.50	15	33.33	32	30.19	26	35.62
21-25 mm.	62	24.90	3	6.67	11	10.38	9	12.33
26-30 mm.	37	14.86	3	6.67	1	0.94	6	8.22
31-35 mm.	9	3.61	1	2.22	2	1.89	2	2.74
36-40 mm.	5	2.01	0	0.00	0	0.00	0	0.00
41-45 mm.	2	0.80	0	0.00	2	1.89	1	1.37
46-50 mm.	2	0.80	0	0.00	3	2.83	0	0.00
51-55 mm.	7	2.81	1	2.22	0	0.00	0	0.00
56-60 mm.	2	0.80	0	0.00	0	0.00	0	0.00
Over 60 mm.	12	4.82	0	0.00	0	0.00	2	2.74
TOTAL	249		45		106		73	

Table 73: Frequencies of Rim Section Attributes for Group 2 Sites: Collar Height (Format 2)

ATTRIBUTES	SITES Chypchar N	Chypchar %	Pipeline N	Pipeline %	Campbell N	Campbell %	Milton N	Milton %
1-5 mm.	0	0.00	0	0.00	1	0.61	0	0.00
6-10 mm.	2	1.38	14	3.80	10	6.13	9	9.47
11-15 mm.	21	14.48	54	14.67	45	27.61	32	33.68
16-20 mm.	39	26.90	81	22.01	37	22.70	28	29.47
21-25 mm.	42	28.97	89	24.18	21	12.88	15	15.79
26-30 mm.	23	15.86	55	14.95	15	9.20	7	7.37
31-35 mm.	10	6.90	32	8.70	9	5.52	1	1.05
36-40 mm.	4	2.76	16	4.35	8	4.91	1	1.05
41-45 mm.	2	1.38	10	2.72	11	6.75	0	0.00
46-50 mm.	0	0.00	6	1.63	4	2.45	1	1.05
51-55 mm.	1	0.69	5	1.36	2	1.23	1	1.05
56-60 mm.	1	0.69	3	0.82	0	0.00	0	0.00
Over 60 mm.	0	0.00	3	0.82	0	0.00	0	0.00
TOTAL	145		368		163		95	

Table 74: Frequencies of Rim Section Attributes for Group 1 Sites: Lip Thickness (Format 2)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
1-2 mm.	0	0.00	0	0.00	0	0.00	0	0.00
3-4 mm.	8	2.82	0	0.00	1	0.85	1	1.23
5-6 mm.	85	29.93	11	20.75	44	37.61	29	35.80
7-8 mm.	141	49.65	19	35.85	54	46.15	43	53.09
9-10 mm.	48	16.90	21	39.62	18	15.38	8	9.88
11-12 mm.	2	0.70	2	3.77	0	0.00	0	0.00
	284		53		117		81	

Table 75: Frequencies of Rim Section Attributes for Group 2 Sites: Lip Thickness (Format 2)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
1-2 mm.	0	0.00	0	0.00	2	1.16	3	3.09
3-4 mm.	14	9.59	20	5.18	19	11.05	13	13.40
5-6 mm.	79	54.11	166	43.01	74	43.02	34	35.05
7-8 mm.	45	30.82	154	39.90	61	35.47	36	37.11
9-10 mm.	8	5.48	41	10.62	13	7.56	9	9.28
11-12 mm.	0	0.00	5	1.30	3	1.74	2	2.06
	146		386		172		97	

Table 76: Frequencies of Rim Section Attributes for Group 1 Sites: Collar Base Thickness (Format 2)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
1-5 mm.	0	0.00	1	0.41	0	0.00	0	0.00
6-10 mm.	17	39.53	108	44.81	57	54.29	41	53.95
11-15 mm.	25	58.14	129	53.53	47	44.76	33	43.42
16-20 mm.	1	2.33	3	1.24	1	0.95	2	2.63
TOTAL	43		241		105		76	

Table 77: Frequencies of Rim Section Attributes for Group 2 Sites: Collar Base Thickness (Format 2)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
1-5 mm.	2	1.39	2	0.55	1	0.64	0	0.00
6-10 mm.	77	53.47	162	44.63	91	57.96	53	59.55
11-15 mm.	64	44.44	186	51.24	62	39.49	36	40.45
16-20 mm.	1	0.69	11	3.03	3	1.91	0	0.00
Over 20 mm.	0	0.00	2	0.55	0	0.00	0	0.00
TOTAL	144		363		157		89	

Table 78: Frequencies of Rim Section Attributes for Group 1 Sites: Rim Diameter at Lip (Format 2)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
50-100 mm.	2	10.00	6	3.95	1	2.00	1	1.92
110-150 mm.	3	15.00	23	15.13	6	12.00	8	15.38
160-200 mm.	2	10.00	31	20.39	16	32.00	7	13.46
210-250 mm.	3	15.00	25	16.45	7	14.00	8	15.38
260-300 mm.	8	40.00	32	21.05	8	16.00	16	30.77
310-350 mm.	2	10.00	17	11.18	2	4.00	4	7.69
360-400 mm.	0	0.00	10	6.58	5	10.00	2	3.85
410-450 mm.	0	0.00	4	2.63	5	10.00	4	7.69
Over 450 mm.	0	0.00	4	2.63	0	0.00	2	3.85
TOTAL	20		152		50		52	

Table 79: Frequencies of Rim Section Attributes for Group 2 Sites: Rim Diameter at Lip (Format 2)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
50-100 mm.	6	7.41	11	5.45	8	8.60	2	4.65
110-150 mm.	19	23.46	34	16.83	17	18.28	7	16.28
160-200 mm.	23	28.40	67	33.17	28	30.11	18	41.86
210-250 mm.	19	23.46	27	13.37	17	18.28	7	16.28
260-300 mm.	8	9.88	25	12.38	9	9.68	3	6.98
310-350 mm.	3	3.70	27	13.37	5	5.38	3	6.98
360-400 mm.	2	2.47	7	3.47	6	6.45	2	4.65
410-450 mm.	1	1.23	4	1.98	1	1.08	1	2.33
Over 450 mm.	0	0.00	0	0.00	2	2.15	0	0.00
TOTAL	81		202		93		43	

Table 80: Frequencies of Rim Section Attributes for Group 1 Sites: Interior Rim Decorative Element (Format 2)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	40	75.47	232	81.40	96	81.36	56	70.89
Trail	1	1.89	1	0.35	1	0.85	1	1.27
Stamp	5	9.43	22	7.72	14	11.86	11	13.92
Punctate	7	13.21	30	10.53	7	5.93	11	13.92
TOTAL	53		285		118		79	

Table 81: Frequencies of Rim Section Attributes for Group 2 Sites: Interior Rim Decorative Element (Format 2)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	137	93.84	382	98.71	138	80.70	95	98.96
Trail	1	0.68	0	0.00	1	0.58	0	0.00
Stamp	2	1.37	1	0.26	6	3.51	0	0.00
Punctate	6	4.11	4	1.03	26	15.20	1	1.04
TOTAL	146		387		171		96	

Table 82: Frequencies of Rim Section Attributes for Group 1 Sites: Interior Rim Motif (Format 2)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	40	75.47	232	81.40	96	81.36	56	70.89
Vertical	0	0.00	5	1.75	5	4.24	3	3.80
Right Oblique	5	9.43	18	6.32	10	8.47	8	10.13
Left Oblique	0	0.00	0	0.00	0	0.00	1	1.27
Circular Punctate	1	1.89	1	0.35	0	0.00	1	1.27
Elliptical Punctate	7	13.21	29	10.18	7	5.93	10	12.66
TOTAL	53		285		118		79	

Table 83: Frequencies of Rim Section Attributes for Group 2 Sites: Interior Rim Motif (Format 2)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	137	93.84	382	98.71	138	80.70	95	98.96
Vertical	2	1.37	0	0.00	3	1.75	0	0.00
Right Oblique	1	0.68	1	0.26	4	2.34	0	0.00
Circ. Punc. Even	2	1.37	0	0.00	6	3.51	1	1.04
Circ. Punc. Horiz.	0	0.00	0	0.00	3	1.75	0	0.00
Elliptical Punctate	4	2.74	4	1.03	17	9.94	0	0.00
TOTAL	146		387		171		96	

Table 84: Frequencies of Rim Section Attributes for Group 1 Sites: Lip Decorative Element (Format 2)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	35	64.81	257	89.55	91	77.12	74	90.24
Trail	12	22.22	15	5.23	20	16.95	7	8.64
Stamp	5	9.26	6	2.09	7	5.93	1	1.22
Punctate	2	3.70	8	2.79	0	0.00	0	0.00
Trail + Stamp	0	0.00	1	0.35	0	0.00	0	0.00
TOTAL	54		287		118		82	

Table 85: Frequencies of Rim Section Attributes for Group 2 Sites: Lip Decorative Element (Format 2)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	143	97.95	362	93.06	169	97.13	97	97.98
Trail	2	1.37	9	2.31	3	1.72	0	0.00
Stamp	0	0.00	4	1.03	2	1.15	0	0.00
Punctate	1	0.68	14	3.60	0	0.00	2	2.02
TOTAL	146		389		174		99	

Table 86: Frequencies of Rim Section Attributes for Group I Sites: Lip Motif (Format 2)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Plain	35	64.81	257	89.55	91	77.12	74	90.24
Vertical	1	1.85	3	1.05	1	0.85	0	0.00
Right Oblique	2	3.70	3	1.05	4	3.39	1	1.22
Left Oblique	0	0.00	0	0.00	2	1.69	0	0.00
Horizontal	13	24.07	14	4.88	20	16.95	7	8.54
Elliptical Punctate	3	5.56	10	3.48	0	0.00	0	0.00
TOTAL	54		287		118		82	

Table 87: Frequencies of Rim Section Attributes for Group 2 Sites: Lip Motif (Format 2)

ATTRIBUTES	SITES Chypchar N	Chypchar %	Pipeline N	Pipeline %	Campbell N	Campbell %	Milton N	Milton %
Plain	143	97.95	362	93.06	169	97.13	97	97.98
Right Oblique	0	0.00	2	0.51	0	0.00	0	0.00
Horizontal	2	1.37	10	2.57	3	1.72	0	0.00
Circular Punctate	1	0.68	0	0.00	0	0.00	1	1.01
Elliptical Punctate	0	0.00	15	3.86	2	1.15	1	1.01
TOTAL	146		389		174		99	

Table 88: Frequencies of Rim Section Attributes for Group 1 Sites: Upper Rim Decorative Element (Format 2)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Plain	0	0.00	0	0.00	1	0.85	1	1.15
Trail	20	37.04	126	43.90	56	47.46	23	26.44
Stamp	16	29.63	79	27.53	36	30.51	37	42.53
Punctate	0	0.00	6	2.09	0	0.00	0	0.00
Trail + Stamp	18	33.33	76	26.48	25	21.19	26	29.89
TOTAL	54		287		118		87	

Table 89: Frequencies of Rim Section Attributes for Group 2 Sites: Upper Rim Decorative Element (Format 2)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	0	0.00	3	0.77	1	0.57	1	1.00
Trail	66	45.21	216	55.53	72	41.14	36	36.00
Stamp	52	35.62	111	28.53	82	46.86	56	56.00
Punctate	0	0.00	0	0.00	2	1.14	0	0.00
Trail + Stamp	28	19.18	59	15.17	18	10.29	7	7.00
TOTAL	146		389		175		100	

Table 90: Frequencies of Rim Section Attributes for Group 1 Sites: Upper Rim Motif (Format 2)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	0	0.00	0	0.00	1	0.85	1	1.18
Vertical	14	5.00	1	1.89	10	8.47	5	5.88
Right Oblique	38	13.57	9	16.98	19	16.10	23	27.06
Left Oblique	5	1.79	1	1.89	5	4.24	4	4.71
Horizontal	95	33.93	15	28.30	39	33.05	18	21.18
VTL x OBR	6	2.14	0	0.00	1	0.85	0	0.00
OBR x OBL	1	0.36	3	5.66	1	0.85	0	0.00
VTL x LDH	7	2.50	1	1.89	1	0.85	3	3.53
OBR x LDH	19	6.79	1	1.89	2	1.69	6	7.06
OBL x LDH	1	0.36	1	1.89	1	0.85	0	0.00
VTL / OBR	2	0.71	0	0.00	0	0.00	0	0.00
OBR / OBL	6	2.14	1	1.89	2	1.69	2	2.35
OBL ! HOR	0	0.00	0	0.00	1	0.85	0	0.00
VTL ! OBL ! HOR	1	0.36	0	0.00	0	0.00	0	0.00
OBR ! OBL ! HOR	1	0.36	0	0.00	2	1.69	0	0.00
VTL > HOR	9	3.21	7	13.21	3	2.54	3	3.53
OBR > HOR	59	21.07	12	22.64	24	20.34	19	22.35
OBL > HOR	9	3.21	0	0.00	3	2.54	0	0.00
HOR > OBR	0	0.00	1	1.89	1	0.85	1	1.18
VTL x OBR HOR	0	0.00	0	0.00	1	0.85	0	0.00
OBR x OBL HOR	6	2.14	0	0.00	0	0.00	0	0.00
OBR / OBL HOR	1	0.36	0	0.00	1	0.85	0	0.00
TOTAL	280		53		118		85	

Table 91: Frequencies of Rim Section Attributes for Group 2 Sites: Upper Rim Motif (Format 2)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	0	0.00	3	0.77	1	0.58	1	1.00
Vertical	12	8.33	50	12.85	28	16.18	34	34.00
Right Oblique	23	15.97	64	16.45	45	26.01	13	13.00
Left Oblique	5	3.47	18	4.63	4	2.31	5	5.00
Horizontal	42	29.17	102	26.22	24	13.87	5	5.00
VTL-X OBR	0	0.00	0	0.00	1	0.58	2	2.00
VTL X OBL	0	0.00	1	0.26	0	0.00	0	0.00
OBR X OBL	1	0.69	6	1.54	2	1.16	1	1.00
VTL X HOR	1	0.69	0	0.00	0	0.00	0	0.00
OBR X HOR	2	1.39	0	0.00	0	0.00	0	0.00
OBL X HOR	1	0.69	0	0.00	0	0.00	0	0.00
VTL X LDA	13	9.03	52	13.37	3	1.73	6	6.00
OBR X LDA	6	4.17	30	7.71	7	4.05	1	1.00
OBL X LDA	2	1.39	5	1.29	1	0.58	0	0.00
VTL - VTL	0	0.00	0	0.00	0	0.00	1	1.00
OBR - OBR	0	0.00	0	0.00	0	0.00	2	2.00
VTL - OBR	0	0.00	2	0.51	2	1.16	3	3.00
VTL - OBL	1	0.69	1	0.26	1	0.58	0	0.00
OBR - OBL	1	0.69	1	0.26	1	0.58	0	0.00
NHO / NHO	0	0.00	0	0.00	1	0.58	0	0.00
VTL / OBR	2	1.39	0	0.00	2	1.16	2	2.00
OBR / OBL	5	3.47	7	1.80	22	12.72	13	13.00
VTL / OBR / OBL	0	0.00	0	0.00	0	0.00	1	1.00
NHO ! HOR	0	0.00	0	0.00	1	0.58	0	0.00
VTL ! HOR	5	3.47	2	0.51	1	0.58	2	2.00
OBR ! HOR	2	1.39	0	0.00	0	0.00	0	0.00
OBL ! HOR	0	0.00	0	0.00	0	0.00	2	2.00
OBR ! OBL HOR	0	0.00	0	0.00	1	0.58	0	0.00
VTL > HOR	7	4.86	10	2.57	7	4.05	1	1.00
OBR > HOR	7	4.86	28	7.20	5	2.89	2	2.00
OBL > HOR	1	0.69	3	0.77	2	1.16	1	1.00
HOR > VTL	0	0.00	1	0.26	0	0.00	0	0.00
HOR > OBR	1	0.69	0	0.00	0	0.00	0	0.00
OBR X OBL > HOR	2	1.39	2	0.51	1	0.58	0	0.00
OBL - OBL > HOR	0	0.00	0	0.00	1	0.58	0	0.00
VTL - OBR > HOR	2	1.39	0	0.00	7	4.05	2	2.00
OBR / OBL > HOR	0	0.00	1	0.26	1	0.58	0	0.00
VTL/OBR/OBL HOR	0	0.00	0	0.00	1	0.58	0	0.00
TOTAL	144		389		173		100	

Table 92: Frequencies of Rim Section Attributes for Group 1 Sites: Secondary Rim Decoration (Format 2)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	247	86.06	49	90.74	100	84.75	80	91.95
Linear Dash	2	0.70	0	0.00	0	0.00	0	0.00
Circular Punctate	0	0.00	0	0.00	0	0.00	1	1.15
Elliptical Punctate	2	0.70	0	0.00	0	0.00	0	0.00
VTL > Primary	0	0.00	1	1.85	0	0.00	0	0.00
OBR > Primary	0	0.00	1	1.85	6	5.08	0	0.00
Primary > OBR	0	0.00	0	0.00	1	0.85	0	0.00
PUC > Primary	0	0.00	0	0.00	0	0.00	1	1.15
PUE > Primary	28	9.76	2	3.70	7	5.93	4	4.60
Primary > PUE	5	1.74	1	1.85	2	1.69	1	1.15
PUE > Primary > PUE	3	1.05	0	0.00	2	1.69	0	0.00
TOTAL	287		54		118		87	

Table 93: Frequencies of Rim Section Attributes for Group 2 Sites: Secondary Rim Decoration (Format 2)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	125	85.62	357	91.77	150	85.71	94	94.00
Linear Dash	3	2.05	9	2.31	0	0.00	0	0.00
Elliptical Punctate	4	2.74	3	0.77	7	4.00	4	4.00
OBR > Primary	0	0.00	2	0.51	2	1.14	0	0.00
OBL > Primary	1	0.68	1	0.26	1	0.57	0	0.00
Primary > OBR	0	0.00	0	0.00	0	0.00	1	1.00
PUE > Primary	4	2.74	10	2.57	3	1.71	0	0.00
Primary > PUC	1	0.68	1	0.26	1	0.57	0	0.00
Primary > PUE	5	3.42	0	0.00	5	2.86	1	1.00
PUE > Primary > PUE	3	2.05	6	1.54	6	3.43	0	0.00
TOTAL	146		389		175		100	

Table 94: Frequencies of Rim Section Attributes for Group 1 Sites: Neck Decorative Element (Format 2)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	115	40.07	18	33.33	43	36.44	34	39.08
Trail	158	55.05	31	57.41	58	49.15	46	52.87
Stamp	11	3.83	2	3.70	14	11.86	5	5.75
Trail + Stamp	3	1.05	3	5.56	3	2.54	2	2.30
TOTAL	287		54		118		87	

Table 95: Frequencies of Rim Section Attributes for Group 2 Sites: Neck Decorative Element (Format 2)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	96	65.75	218	56.04	65	37.1	50	50.00
Trail	43	29.45	167	42.93	102	58.2	45	45.00
Stamp	6	4.11	3	0.77	8	4.5	4	4.00
Punctate	1	0.68	0	0.00	0	0.0	1	1.00
Trail + Punctate	0	0.00	1	0.26	0	0.0	0	0.00
TOTAL	146		389		175		100	

Table 96: Frequencies of Rim Section Attributes for Group 1 Sites: Neck Motif (Format 2)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	115	40.07	18	33.96	43	36.44	34	39.08
Vertical	0	0.00	0	0.00	2	1.69	0	0.00
Right Oblique	4	1.39	1	1.89	13	11.02	4	4.60
Left Oblique	0	0.00	1	1.89	0	0.00	1	1.15
Horizontal	159	55.40	29	54.72	52	44.07	44	50.57
OBR / OBL	4	1.39	0	0.00	2	1.69	1	1.15
VTL / OBR / OBL	1	0.35	0	0.00	0	0.00	0	0.00
OBR ! HOR	0	0.00	0	0.00	1	0.85	0	0.00
OBR ! OBL HOR	1	0.35	0	0.00	0	0.00	0	0.00
OBL > HOR	1	0.35	0	0.00	1	0.85	0	0.00
HOR > VTL	0	0.00	0	0.00	1	0.85	1	1.15
HOR > OBR	2	0.70	4	7.55	3	2.54	2	2.30
TOTAL	287		53		118		87	

Table 97: Frequencies of Rim Section Attributes for Group 2 Sites: Neck Motif (Format 2)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	97	66.44	218	56.04	65	37.14	51	51.00
Vertical	1	0.68	0	0.00	0	0.00	0	0.00
Right Oblique	5	3.42	2	0.51	6	3.43	8	8.00
Left Oblique	1	0.68	2	0.51	0	0.00	0	0.00
Horizontal	40	27.40	159	40.87	96	54.86	40	40.00
OBR / OBL	1	0.68	5	1.29	3	1.71	1	1.00
HOR > VTL	0	0.00	0	0.00	1	0.57	0	0.00
HOR > OBR	0	0.00	2	0.51	4	2.29	0	0.00
HOR > OBL	1	0.68	1	0.26	0	0.00	0	0.00
TOTAL	146		389		175		100	

Table 98: Frequencies of Rim Section Attributes for Group 1 Sites: Secondary Neck Decoration (Format 2)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	64	30.92	22	56.41	42	44.68	31	54.39
Elliptical Punctate	0	0.00	0	0.00	1	1.06	0	0.00
VTL > Primary	3	1.45	0	0.00	0	0.00	0	0.00
OBR > Primary	2	0.97	5	12.82	7	7.45	3	5.26
LDA > Primary	0	0.00	0	0.00	2	2.13	5	8.77
Primary > VTL	0	0.00	0	0.00	0	0.00	1	1.75
Primary > OBR	2	0.97	2	5.13	9	9.57	0	0.00
Primary > OBL	2	0.97	1	2.56	2	2.13	0	0.00
Primary > LDA	0	0.00	1	2.56	0	0.00	0	0.00
PCN > Primary	0	0.00	0	0.00	0	0.00	1	1.75
PCH > Primary	1	0.48	1	2.56	1	1.06	1	1.75
PUE > Primary	73	35.27	3	7.69	18	19.15	7	12.28
Primary > PUE	60	28.99	4	10.26	12	12.77	8	14.04
TOTAL	207		39		94		57	

Table 99: Frequencies of Rim Section Attributes for Group 2 Sites: Secondary Neck Decoration (Format 2)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	76	56.72	196	60.87	75	64.66	49	79.03
VTL > Primary	0	0.00	0	0.00	1	0.86	0	0.00
OBR > Primary	0	0.00	7	2.17	0	0.00	1	1.61
OBL > Primary	1	0.75	0	0.00	1	0.86	0	0.00
LDA > Primary	3	2.24	1	0.31	0	0.00	0	0.00
Primary > OBR	1	0.75	2	0.62	3	2.59	1	1.61
Primary > LDA	1	0.75	0	0.00	0	0.00	0	0.00
PUC > Primary	0	0.00	0	0.00	1	0.86	2	3.23
PUE > Primary	43	32.09	78	24.22	15	12.93	5	8.06
Primary > PUC	0	0.00	0	0.00	1	0.86	1	1.61
Primary > PUE	9	6.72	38	11.80	19	16.38	3	4.84
TOTAL	134		322		116		62	

Table 100: Frequencies of Rim Section Attributes for Group 1 Sites: Interior Rim Motif (Format 3)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	232	81.40	40	75.47	96	81.36	56	70.89
Non-Horizontal	23	8.07	5	9.43	15	12.71	12	15.19
Circular Punctate	1	0.35	1	1.89	0	0.00	1	1.27
Elliptical Punctate	29	10.18	7	13.21	7	5.93	10	12.66
TOTAL	285		53		118		79	

Table 101: Frequencies of Rim Section Attributes for Group 2 Sites: Interior Rim Motif (Format 3)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	137	93.84	382	98.71	138	80.70	95	98.96
Non-Horizontal	3	2.05	1	0.26	7	4.09	0	0.00
Circular Punctate	2	1.37	0	0.00	9	5.26	1	1.04
Elliptical Punctate	4	2.74	4	1.03	17	9.94	0	0.00
TOTAL	146		387		171		96	

Table 102: Frequencies of Rim Section Attributes for Group 1 Sites: Lip Motif (Format 3)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	257	89.55	35	64.81	91	77.12	74	90.24
Non-Horizontal	6	2.09	3	5.56	7	5.93	1	1.22
Horizontal	14	4.88	13	24.07	20	16.95	7	8.54
Circular Punctate	0	0.00	0	0.00	0	0.00	0	0.00
Elliptical Punctate	10	3.48	3	5.56	0	0.00	0	0.00
TOTAL	287		54		118		82	

Table 103: Frequencies of Rim Section Attributes for Group 2 Sites: Lip Motif (Format 3)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	143	97.95	362	93.06	169	97.13	97	97.98
Non-Horizontal	0	0.00	2	0.51	0	0.00	0	0.00
Horizontal	2	1.37	10	2.57	3	1.72	0	0.00
Circular Punctate	1	0.68	0	0.00	0	0.00	1	1.01
Elliptical Punctate	0	0.00	15	3.86	2	1.15	1	1.01
TOTAL	146		389		174		99	

Table 104: Frequencies of Rim Section Attributes for Group 1 Sites: Upper Rim Motif (Format 3)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	0	0.00	0	0.00	1	0.85	1	1.18
Non-Horizontal	57	20.36	11	20.75	34	28.81	32	37.65
Horizontal	95	33.93	15	28.30	39	33.05	18	21.18
NHO x NHO	7	2.50	3	5.66	2	1.69	0	0.00
NHO x HOR	0	0.00	0	0.00	0	0.00	0	0.00
NHO x LDA	27	9.64	3	5.66	4	3.39	9	10.59
NHO - NHO	0	0.00	0	0.00	0	0.00	0	0.00
NHO / NHO	8	2.86	1	1.89	2	1.69	2	2.35
NHO ! HOR	2	0.71	0	0.00	3	2.54	0	0.00
NHO > HOR	77	27.50	19	35.85	30	25.42	22	25.88
HOR > NHO	0	0.00	1	1.89	1	0.85	1	1.18
NHOxNHO>HOR	6	2.14	0	0.00	1	0.85	0	0.00
NHO-NHO>HOR	0	0.00	0	0.00	0	0.00	0	0.00
NHO/NHO>HOR	1	0.36	0	0.00	1	0.85	0	0.00
TOTAL	280		53		118		85	

Table 105: Frequencies of Rim Section Attributes for Group 2 Sites: Upper Rim Motif (Format 3)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	0	0.00	3	0.77	1	0.58	1	1.00
Non-Horizontal	40	27.59	132	33.93	77	44.51	52	52.00
Horizontal	42	28.97	102	26.22	24	13.87	5	5.00
NHO x NHO	1	0.69	7	1.80	3	1.73	3	3.00
NHO x HOR	4	2.76	0	0.00	0	0.00	0	0.00
NHO x LDA	22	15.17	87	22.37	11	6.36	7	7.00
NHO - NHO	2	1.38	4	1.03	4	2.31	6	6.00
NHO / NHO	7	4.83	7	1.80	25	14.45	16	16.00
NHO ! HOR	7	4.83	2	0.51	3	1.73	4	4.00
NHO > HOR	15	10.34	41	10.54	14	8.09	4	4.00
HOR > NHO	1	0.69	1	0.26	0	0.00	0	0.00
NHOxNHO>HOR	2	1.38	2	0.51	1	0.58	0	0.00
NHO-NHO>HOR	2	1.38	0	0.00	8	4.62	2	2.00
NHO/NHO>HOR	0	0.00	1	0.26	2	1.16	0	0.00
TOTAL	145		389		173		100	

Table 106: Frequencies of Rim Section Attributes for Group 1 Sites: Secondary Rim Decoration (Format 3)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	49	90.74	247	86.06	100	84.75	80	91.95
Linear Dash	0	0.00	2	0.70	0	0.00	0	0.00
Circular Punctate	0	0.00	0	0.00	0	0.00	1	1.15
Elliptical Punctate	0	0.00	2	0.70	0	0.00	0	0.00
NHO > Primary	2	3.70	0	0.00	6	5.08	0	0.00
Primary > NHO	0	0.00	0	0.00	1	0.85	0	0.00
PUC > Primary	0	0.00	0	0.00	0	0.00	1	1.15
PUE > Primary	2	3.70	28	9.76	7	5.93	4	4.60
Primary > PUC	0	0.00	0	0.00	0	0.00	0	0.00
Primary > PUE	1	1.85	5	1.74	2	1.69	1	1.15
PUE > Primary PUE	0	0.00	3	1.05	2	1.69	0	0.00
TOTAL	54		287		118		87	

Table 107: Frequencies of Rim Section Attributes for Group 2 Sites: Secondary Rim Decoration (Format 3)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	125	85.62	357	91.77	150	85.71	94	94.00
Linear Dash	3	2.05	9	2.31	0	0.00	0	0.00
Circular Punctate	0	0.00	0	0.00	0	0.00	0	0.00
Elliptical Punctate	4	2.74	3	0.77	7	4.00	4	4.00
NHO > Primary	1	0.68	3	0.77	3	1.71	0	0.00
Primary > NHO	0	0.00	0	0.00	0	0.00	1	1.00
PUC > Primary	0	0.00	0	0.00	0	0.00	0	0.00
PUE > Primary	4	2.74	10	2.57	3	1.71	0	0.00
Primary > PUC	1	0.68	1	0.26	1	0.57	0	0.00
Primary > PUE	5	3.42	0	0.00	5	2.86	1	1.00
PUE > Primary > PUE	3	2.05	6	1.54	6	3.43	0	0.00
TOTAL	146		389		175		100	

Table 108: Frequencies of Rim Section Attributes for Group 1 Sites: Neck Motif (Format 3)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	18	33.96	115	40.07	43	36.44	34	39.08
Non-Horizontal	2	3.77	4	1.39	15	12.71	5	5.75
Horizontal	29	54.72	159	55.40	52	44.07	44	50.57
NHO / NHO	0	0.00	5	1.74	2	1.69	1	1.15
NHO ! HOR	0	0.00	1	0.35	1	0.85	0	0.00
NHO > HOR	0	0.00	1	0.35	1	0.85	0	0.00
HOR > NHO	4	7.55	2	0.70	4	3.39	3	3.45
TOTAL	53		287		118		87	

Table 109: Frequencies of Rim Section Attributes for Group 2 Sites: Neck Motif (Format 3)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	97	66.44	218	56.04	65	37.14	51	51.00
Non-Horizontal	7	4.79	4	1.03	6	3.43	8	8.00
Horizontal	40	27.40	159	40.87	96	54.86	40	40.00
NHO / NHO	1	0.68	5	1.29	3	1.71	1	1.00
NHO ! HOR	0	0.00	0	0.00	0	0.00	0	0.00
NHO > HOR	0	0.00	0	0.00	0	0.00	0	0.00
HOR > NHO	1	0.68	3	0.77	5	2.86	0	0.00
	146		389		175		100	

Table 110: Frequencies of Rim Section Attributes for Group 1 Sites: Secondary Neck Decoration (Format 3)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	64	30.92	22	56.41	42	44.68	31	54.39
Elliptical Punctate	0	0.00	0	0.00	1	1.06	0	0.00
NHO > Primary	5	2.42	5	12.82	7	7.45	3	5.26
LDA > Primary	0	0.00	0	0.00	2	2.13	5	8.77
Primary > NHO	4	1.93	3	7.69	11	11.70	1	1.75
Primary > LDA	0	0.00	1	2.56	0	0.00	0	0.00
PUC > Primary	1	0.48	1	2.56	1	1.06	2	3.51
PUE > Primary	74	35.27	3	7.69	18	19.15	7	12.28
Primary > PUC	0	0.00	0	0.00	0	0.00	0	0.00
Primary > PUE	60	28.99	4	10.26	12	12.77	8	14.04
	207		39		94		57	

Table 111: Frequencies of Rim Section Attributes for Group 2 Sites: Secondary Neck Decoration (Format 3)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	76	56.72	196	60.87	75	64.66	49	79.03
Elliptical Punctate	0	0.00	0	0.00	0	0.00	0	0.00
NHO > Primary	1	0.75	7	2.17	2	1.72	1	1.61
LDA > Primary	3	2.24	1	0.31	0	0.00	0	0.00
Primary > NHO	1	0.75	2	0.62	3	2.59	1	1.61
Primary > LDA	1	0.75	0	0.00	0	0.00	0	0.00
PUC > Primary	0	0.00	0	0.00	1	0.86	2	3.23
PUE > Primary	43	32.09	78	24.22	15	12.93	5	8.06
Primary > PUC	0	0.00	0	0.00	1	0.86	1	1.61
PUE > Primary PUE	9	6.72	38	11.80	19	16.38	3	4.84
	134		322		116		62	

Table 112: Frequencies of Rim Section Attributes for Group 1 Sites: Interior Rim Motif (Format 4)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	232	81.40	40	75.47	96	81.36	56	70.89
Linear	23	8.07	5	9.43	15	12.71	12	15.19
Punctate	30	10.53	8	15.09	7	5.93	11	13.92
TOTAL	285		53		118		79	

Table 113: Frequencies of Rim Section Attributes for Group 2 Sites: Interior Rim Motif (Format 4)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	137	93.84	382	98.71	138	80.70	95	98.96
Linear	3	2.05	1	0.26	7	4.09	0	0.00
Punctate	6	4.11	4	1.03	26	15.20	1	1.04
TOTAL	146		382		171		96	

Table 114: Frequencies of Rim Section Attributes for Group 1 Sites: Lip Motif (Format 4)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Plain	257	89.55	35	64.81	91	77.12	74	90.24
Linear	20	6.97	16	29.63	27	22.88	8	9.76
Punctate	10	3.48	3	5.56	0	0.00	0	0.00
TOTAL	287		54		118		82	

Table 115: Frequencies of Rim Section Attributes for Group 2 Sites: Lip Motif (Format 4)

ATTRIBUTES	SITES Chypchar N	Chypchar %	Pipeline N	Pipeline %	Campbell N	Campbell %	Milton N	Milton %
Plain	143	97.95	362	93.06	169	97.13	97	97.98
Linear	2	1.37	12	3.08	3	1.72	0	0.00
Punctate	1	0.68	15	3.86	2	1.15	2	2.02
	146		389		174		99	

Table 116: Frequencies of Rim Section Attributes for Group 1 Sites: Upper Rim Motif (Format 4)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Plain	0	0.00	0	0.00	1	0.85	1	1.18
Linear	152	54.29	26	49.06	73	61.86	50	58.82
LIN x LIN	34	12.14	6	11.32	6	5.08	9	10.59
LIN - LIN	0	0.00	0	0.00	0	0.00	0	0.00
LIN / LIN	8	2.86	1	1.89	2	1.69	2	2.35
LIN ! LIN	2	0.71	0	0.00	3	2.54	0	0.00
LIN > LIN	77	27.50	20	37.74	31	26.27	23	27.06
LINxLIN>LIN	6	2.14	0	0.00	1	0.85	0	0.00
LIN-LIN>LIN	0	0.00	0	0.00	0	0.00	0	0.00
LIN/LIN>LIN	1	0.36	0	0.00	1	0.85	0	0.00
TOTAL	280		53		118		85	

Table 117: Frequencies of Rim Section Attributes for Group 2 Sites: Upper Rim Motif (Format 4)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	0	0.00	3	0.77	1	0.58	1	1.00
Linear	82	56.55	234	60.15	101	58.38	57	57.00
LIN x LIN	27	18.62	94	24.16	14	8.09	10	10.00
LIN - LIN	2	1.38	4	1.03	4	2.31	6	6.00
LIN / LIN	7	4.83	7	1.80	25	14.45	16	16.00
LIN ! LIN	7	4.83	2	0.51	3	1.73	4	4.00
LIN > LIN	16	11.03	42	10.80	14	8.09	4	4.00
LINxLIN>LIN	2	1.38	2	0.51	1	0.58	0	0.00
LIN-LIN>LIN	2	1.38	0	0.00	8	4.62	2	2.00
LIN/LIN>LIN	0	0.00	1	0.26	2	1.16	0	0.00
TOTAL	145		389		173		100	

Table 118: Frequencies of Rim Section Attributes for Group 1 Sites: Secondary Rim Decoration (Format 4)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	247	86.06	49	90.74	100	84.75	80	91.95
Linear	2	0.70	0	0.00	0	0.00	0	0.00
Punctate	2	0.70	0	0.00	0	0.00	1	1.15
LIN > Primary	0	0.00	2	3.70	6	5.08	0	0.00
Primary > LIN	0	0.00	0	0.00	1	0.85	0	0.00
PUN > Primary	28	9.76	2	3.70	7	5.93	5	5.75
Primary > PUN	5	1.74	1	1.85	2	1.69	1	1.15
PUN > Primary > PUN	3	1.05	0	0.00	2	1.69	0	0.00
TOTAL	287		54		118		87	

Table 119: Frequencies of Rim Section Attributes for Group 2 Sites: Secondary Rim Decoration (Format 4)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	125	85.62	357	91.77	150	85.71	94	94.00
Linear	3	2.05	9	2.31	0	0.00	0	0.00
Punctate	4	2.74	3	0.77	7	4.00	4	4.00
LIN > Primary	1	0.68	3	0.77	3	1.71	0	0.00
Primary > LIN	0	0.00	0	0.00	0	0.00	1	1.00
PUN > Primary	4	2.74	10	2.57	3	1.71	0	0.00
Primary > PUN	6	4.11	1	0.26	6	3.43	1	1.00
PUN > Primary > PUN	3	2.05	6	1.54	6	3.43	0	0.00
TOTAL	146		389		175		100	

Table 120: Frequencies of Rim Section Attributes for Group 1 Sites: Neck Motif (Format 4)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	115	40.07	18	33.96	43	36.44	34	39.08
Linear	163	56.79	31	58.49	67	56.78	49	56.32
LIN / LIN	5	1.74	0	0.00	2	1.69	1	1.15
LIN ! LIN	1	0.35	0	0.00	1	0.85	0	0.00
LIN > LIN	3	1.05	4	7.55	5	4.24	3	3.45
TOTAL	287		53		118		87	

Table 121: Frequencies of Rim Section Attributes for Group 2 Sites: Neck Motif (Format 4)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	97	66.44	218	56.04	65	37.14	51	51.00
Linear	47	32.19	163	41.90	102	58.29	48	48.00
LIN / LIN	1	0.68	5	1.29	3	1.71	1	1.00
LIN ! LIN	0	0.00	0	0.00	0	0.00	0	0.00
LIN > LIN	1	0.68	3	0.77	5	2.86	0	0.00
TOTAL	146		389		175		100	

Table 122: Frequencies of Rim Section Attributes for Group 1 Sites: Secondary Neck Decoration (Format 4)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Plain	64	30.92	22	56.41	42	44.68	31	54.39
Punctate	0	0.00	0	0.00	1	1.06	0	0.00
LIN > Primary	5	2.42	5	12.82	9	9.57	8	14.04
Primary > LIN	4	1.93	4	10.26	11	11.70	1	1.75
PUN > Primary	74	35.75	4	10.26	19	20.21	9	15.79
Primary > PUN	60	28.99	4	10.26	12	12.77	8	14.04
TOTAL	207		39		94		57	

Table 123: Frequencies of Rim Section Attributes for Group 2 Sites: Secondary Neck Decoration (Format 4)

ATTRIBUTES	SITES Chypchar N	Chypchar %	Pipeline N	Pipeline %	Campbell N	Campbell %	Milton N	Milton %
Plain	76	56.72	196	60.87	75	64.6	49	79.03
Punctate	0	0.00	0	0.00	0	0.0	0	0.00
LIN > Primary	4	2.99	8	2.48	2	1.7	1	1.61
Primary > LIN	2	1.49	2	0.62	3	2.5	1	1.61
PUN > Primary	43	32.09	78	24.22	16	13.7	7	11.29
Primary > PUN	9	6.72	38	11.80	20	17.2	4	6.45
TOTAL	134		322		116		62	

Table 124: Frequencies of Rim Section Attributes for Group 1 Sites: Interior Rim Motif (Format 5)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Plain	232	81.40	40	75.47	96	81.36	56	70.89
Simple	53	18.60	13	24.53	22	18.64	23	29.11
TOTAL	285		53		118		79	

Table 125: Frequencies of Rim Section Attributes for Group 2 Sites: Interior Rim Motif (Format 5)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	137	93.84	382	98.71	138	80.70	95	98.96
Simple	9	6.16	5	1.29	33	19.30	1	1.04
TOTAL	146		387		171		96	

Table 126: Frequencies of Rim Section Attributes for Group 1 Sites: Lip Motif (Format 5)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	257	89.55	35	64.81	91	77.12	74	90.24
Simple	30	10.45	19	35.19	27	22.88	8	9.76
TOTAL	287		54		118		82	

Table 127: Frequencies of Rim Section Attributes for Group 2 Sites: Lip Motif (Format 5)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	143	97.95	362	93.06	169	97.13	97	97.98
Simple	3	2.05	27	6.94	5	2.87	2	2.02
TOTAL	146		389		174		99	

Table 128: Frequencies of Rim Section Attributes for Group 1 Sites: Upper Rim Motif (Format 5)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Plain	0	0.00	0	0.00	1	0.85	1	1.18
Simple	152	54.29	26	49.06	73	61.86	50	58.82
Superimposed	34	12.14	6	11.32	6	5.08	9	10.59
Horizontal Diff.	10	3.57	1	1.89	5	4.24	2	2.35
Vert. Diff. Sim.	77	27.50	20	37.74	31	26.27	23	27.06
SID > SIM	6	2.14	0	0.00	1	0.85	0	0.00
HDI > SIM	1	0.36	0	0.00	1	0.85	0	0.00
TOTAL	280		53		118		85	

Table 129: Frequencies of Rim Section Attributes for Group 2 Sites: Upper Rim Motif (Format 5)

ATTRIBUTES	SITES Chypchar N	Chypchar %	Pipeline N	Pipeline %	Campbell N	Campbell %	Milton N	Milton %
Plain	0	0.00	1	0.58	3	0.77	1	1.00
Simple	82	56.55	101	58.38	234	60.15	57	57.00
Superimposed	27	18.62	14	8.09	94	24.16	10	10.00
Horizontal Diff.	16	11.03	32	18.50	13	3.34	26	26.00
Vert. Diff. Sim.	16	11.03	14	8.09	42	10.80	4	4.00
SID > SIM	2	1.38	1	0.58	2	0.51	0	0.00
HDI > SIM	2	1.38	10	5.78	1	0.26	2	2.00
TOTAL	145		173		389		100	

Table 130: Frequencies of Rim Section Attributes for Group 1 Sites: Secondary Rim Decoration (Format 5)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Plain	247	86.06	49	90.74	100	84.75	80	91.95
Simple	4	1.39	0	0.00	0	0.00	1	1.15
Vert. Positioning	33	11.50	5	9.26	16	13.56	6	6.90
Vert. Diff. Sim.	3	1.05	0	0.00	2	1.69	0	0.00
TOTAL	287		54		118		87	

Table 131: Frequencies of Rim Section Attributes for Group 2 Sites: Secondary Rim Decoration (Format 5)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	125	85.62	357	91.77	150	85.71	94	94.00
Simple	7	4.79	12	3.08	7	4.00	4	4.00
Vert. Positioning	11	7.53	14	3.60	12	6.86	2	2.00
Vert. Diff. Sim.	3	2.05	6	1.54	6	3.43	0	0.00
TOTAL	146		389		175		100	

Table 132: Frequencies of Rim Section Attributes for Group 1 Sites: Neck Motif (Format 5)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	115	40.07	18	33.96	43	36.44	34	39.08
Simple	163	56.79	31	58.49	67	56.78	49	56.32
Horizontal Diff.	6	2.09	0	0.00	3	2.54	1	1.15
Vert. Diff. Sim.	3	1.05	4	7.55	5	4.24	3	3.45
	287		53		118		87	

Table 133: Frequencies of Rim Section Attributes for Group 2 Sites: Neck Motif (Format 5)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	97	66.44	218	56.04	65	37.14	51	51.00
Simple	47	32.19	163	41.90	102	58.29	48	48.00
Horizontal Diff.	1	0.68	5	1.29	3	1.71	1	1.00
Vert. Diff. Sim.	1	0.68	3	0.77	5	2.86	0	0.00
TOTAL	146		389		175		100	

Table 134: Frequencies of Rim Section Attributes for Group 1 Sites: Secondary Neck Decoration (Format 5)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	64	30.92	22	56.41	42	44.68	31	54.39
Simple	0	0.00	0	0.00	1	1.06	0	0.00
Vert. Positioning	143	69.08	17	43.59	51	54.26	26	45.61
TOTAL	207		39		94		57	

Table 135: Frequencies of Rim Section Attributes for Group 2 Sites: Secondary Neck Decoration (Format 5)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	76	56.72	196	60.87	75	64.66	49	79.03
Vert. Positioning	58	43.28	126	39.13	41	35.34	13	20.97
TOTAL	134		322		116		62	

Table 136: Frequencies of Rim Section Attributes for Group 1 Sites: Secondary Rim Decoration (Format 6)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Absent	247	86.06	49	90.74	100	84.75	80	91.95
Present	40	13.94	5	9.26	18	15.25	7	8.05
TOTAL	287		54		118		87	

Table 137: Frequencies of Rim Section Attributes for Group 2 Sites: Secondary Rim Decoration (Format 6)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Absent	125	85.62	357	91.77	150	85.71	94	94.00
Present	21	14.38	32	8.23	25	14.29	6	6.00
TOTAL	146		389		175		100	

Table 138: Frequencies of Rim Section Attributes for Group 1 Sites: Neck Motif (Format 6)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Absent	115	40.07	18	33.96	43	36.44	34	39.08
Present	172	59.93	35	66.04	75	63.56	53	60.92
TOTAL	287		53		118		87	

Table 139: Frequencies of Rim Section Attributes for Group 2 Sites: Neck Motif (Format 6)

ATTRIBUTES	SITES Chypchar N	Chypchar %	Pipeline N	Pipeline %	Campbell N	Campbell %	Milton N	Milton %
Absent	97	66.44	218	56.04	65	37.14	51	51.00
Present	49	33.56	171	43.96	110	62.86	49	49.00
TOTAL	146		389		175		100	

Table 140: Frequencies of Rim Section Attributes for Group 1 Sites: Secondary Neck Decoration (Format 6)

ATTRIBUTES	SITES Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Absent	64	30.92	22	56.41	42	44.68	31	54.39
Present	143	69.08	17	43.59	52	55.32	26	45.61
TOTAL	207		39		94		57	

Table 141: Frequencies of Rim Section Attributes for Group 2 Sites: Secondary Neck Decoration (Format 6)

ATTRIBUTES	SITES Chypchar N	Chypchar %	Pipeline N	Pipeline %	Campbell N	Campbell %	Milton N	Milton %
Absent	76	56.72	196	60.87	75	64.66	49	79.03
Present	58	43.28	126	39.13	41	35.34	13	20.97
TOTAL	134		322		116		62	

Table 142: Frequencies of Bowl Section Attributes for Group 1 Sites: Exterior Bowl Profile (Format 2)

ATTRIBUTES	SITES: Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Straight	40	35.71	6	37.50	13	46.43	4	16.00
Concave	4	3.57	0	0.00	0	0.00	0	0.00
Convex	68	60.71	10	62.50	15	53.57	21	84.00
TOTAL	112		16		28		25	

Table 143: Frequencies of Bowl Section Attributes for Group 2 Sites: Exterior Bowl Profile (Format 2)

ATTRIBUTES	SITES: Chypchar N	Chypchar %	Pipeline N	Pipeline %	Campbell N	Campbell %	Milton N	Milton %
Straight	10	14.49	15	21.43	1	3.23	3	15.79
Concave	48	69.57	45	64.29	23	74.19	8	42.11
Convex	11	15.94	10	14.29	7	22.58	8	42.11
TOTAL	69		70		31		19	

Table 144: Frequencies of Bowl Section Attributes for Group 1 Sites: Interior Bowl Profile (Format 2)

ATTRIBUTES	SITES: Rife N	Rife %	Unick N	Unick %	Cr. Lake N	Cr. Lake %	Van Eden N	Van Eden %
Straight	36	32.43	7	43.75	9	32.14	7	28.00
Concave	1	0.90	0	0.00	0	0.00	1	4.00
Convex	74	66.67	9	56.25	19	67.86	17	68.00
TOTAL	111		16		28		25	

Table 145: Frequencies of Bowl Section Attributes for Group 2 Sites: Interior Bowl Profile (Format 2)

ATTRIBUTES	SITES: Chypchar N	Chypchar %	Pipeline N	Pipeline %	Campbell N	Campbell %	Milton N	Milton %
Straight	10	14.49	12	17.14	4	12.90	6	31.58
Concave	1	1.45	0	0.00	0	0.00	0	0.00
Convex	58	84.06	58	82.86	27	87.10	13	68.42
TOTAL	69		70		31		19	

Table 146: Frequencies of Bowl Section Attributes for Group 1 Sites: Lip Thickness (Format 2)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
1-5 mm.	81	73.64	12	80.00	18	64.29	17	73.91
6-10 mm.	22	20.00	3	20.00	9	32.14	5	21.74
11-15 mm.	5	4.55	0	0.00	0	0.00	1	4.35
16-20 mm.	2	1.82	0	0.00	1	3.57	0	0.00
TOTAL	110		15		28		23	

Table 147: Frequencies of Bowl Section Attributes for Group 2 Sites: Lip Thickness (Format 2)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
1-5 mm.	59	85.51	60	85.71	28	93.33	17	89.47
6-10 mm.	10	14.49	10	14.29	2	6.67	2	10.53
TOTAL	69		70		30		19	

Table 148: Frequencies of Bowl Section Attributes for Group 1 Sites: Bowl Motif (Format 2)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	48	42.86	11	68.75	11	39.29	10	40.00
Horizontal Even	47	41.96	3	18.75	16	57.14	8	32.00
Random Circ. Punc.	1	0.89	0	0.00	0	0.00	0	0.00
Horiz. Circ. Punc.	0	0.00	2	12.50	0	0.00	0	0.00
Random Ellip. Punc.	1	0.89	0	0.00	0	0.00	0	0.00
Horiz. Ellip. Punc.	1	0.89	0	0.00	0	0.00	0	0.00
OBR / OBL	2	1.79	0	0.00	0	0.00	1	4.00
NHO ! HOR	1	0.89	0	0.00	1	3.57	0	0.00
HOE > VTL	1	0.89	0	0.00	0	0.00	1	4.00
HOE>VTL/OBR	0	0.00	0	0.00	0	0.00	1	4.00
HOR>OBR/OBL	10	8.93	0	0.00	0	0.00	3	12.00
VTL-OBR>HOR	0	0.00	0	0.00	0	0.00	1	4.00
TOTAL	112		16		28		25	

Table 149: Frequencies of Bowl Section Attributes for Group 2 Sites: Bowl Motif (Format 2)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	57	82.61	42	60.00	21	67.74	11	57.89
Horizontal Even	12	17.39	27	38.57	9	29.03	8	42.11
OBR / OBL	0	0.00	0	0.00	1	3.23	0	0.00
HOR>OBR/OBL	0	0.00	1	1.43	0	0.00	0	0.00
TOTAL	69		70		31		19	

Table 150: Frequencies of Bowl Section Attributes for Group 1 Sites: Secondary Bowl Decoration (Format 2)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	69	74.19	13	92.86	12	50.00	13	72.22
Non-Hor. Circ. Punc	0	0.00	0	0.00	0	0.00	0	0.00
Horiz. Circ. Punc.	0	0.00	0	0.00	0	0.00	0	0.00
Primary > PCH	14	15.05	0	0.00	5	20.83	4	22.22
Primary > PEH	10	10.75	1	7.14	7	29.17	1	5.56
TOTAL	93		14		24		18	

Table 151: Frequencies of Bowl Section Attributes for Group 2 Sites: Secondary Bowl Decoration (Format 2)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	63	94.03	53	76.81	27	93.10	18	100.00
Non-Hor. Circ. Punc	0	0.00	1	1.45	0	0.00	0	0.00
Horiz. Circ. Punc.	0	0.00	1	1.45	0	0.00	0	0.00
Primary > PCH	4	5.97	14	20.29	2	6.90	0	0.00
Primary > PEH	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	67		69		29		18	

Table 152: Frequencies of Bowl Section Attributes for Group 1 Sites: Bowl Motif (Format 3)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	48	42.86	11	68.75	11	39.29	10	40.00
Horizontal	47	41.96	3	18.75	16	57.14	8	32.00
Circular Punctate	1	0.89	2	12.50	0	0.00	0	0.00
Elliptical Punctate	2	1.79	0	0.00	0	0.00	0	0.00
NHO / NHO	2	1.79	0	0.00	0	0.00	1	4.00
NHO ! HOR	1	0.89	0	0.00	1	3.57	0	0.00
HOR > NHO	1	0.89	0	0.00	0	0.00	1	4.00
HOR>NHO/NHO	10	8.93	0	0.00	0	0.00	4	16.00
NHO-NHO>HOR	0	0.00	0	0.00	0	0.00	1	4.00
TOTAL	118		16		28		25	

Table 153: Frequencies of Bowl Section Attributes for Group 2 Sites: Bowl Motif (Format 3)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	57	82.61	42	60.00	21	67.74	11	57.89
Horizontal	12	17.39	27	38.57	9	29.03	8	42.11
NHO /\ NHO	0	0.00	0	0.00	1	3.23	0	0.00
HOR>NHO/NHO	0	0.00	1	1.43	0	0.00	0	0.00
TOTAL	69		70		31		19	

Table 154: Frequencies of Bowl Section Attributes for Group 1 Sites: Secondary Bowl Decoration (Format 3)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	69	74.19	13	92.86	12	50.00	13	72.22
Circular Punctate	0	0.00	0	0.00	0	0.00	0	0.00
Primary > PUC	14	15.05	0	0.00	5	20.83	4	22.22
Primary > PUE	10	10.75	1	7.14	7	29.17	1	5.56
TOTAL	93		14		24		18	

Table 155: Frequencies of Bowl Section Attributes for Group 2 Sites: Secondary Bowl Decoration (Format 3)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	63	94.03	53	76.81	27	93.10	18	100.00
Circular Punctate	0	0.00	2	2.90	0	0.00	0	0.00
Primary > PUC	4	5.97	14	20.29	2	6.90	0	0.00
Primary > PUE	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	67		69		29		18	

Table 156: Frequencies of Bowl Section Attributes for Group 1 Sites: Bowl Motif (Format 4)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Plain	48	42.86	11	68.75	11	39.29	10	40.00
Linear	47	41.96	3	18.75	16	57.14	8	32.00
Punctate	3	2.68	2	12.50	0	0.00	0	0.00
LIN / LIN	2	1.79	0	0.00	0	0.00	1	4.00
LIN ! LIN	1	0.89	0	0.00	1	3.57	0	0.00
LIN > LIN	1	0.89	0	0.00	0	0.00	1	4.00
LIN>LIN/LIN	10	8.93	0	0.00	0	0.00	4	16.00
LIN-LIN>LIN	0	0.00	0	0.00	0	0.00	1	4.00
TOTAL	112		16		28		25	

Table 157: Frequencies of Bowl Section Attributes for Group 2 Sites: Bowl Motif (Format 4)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Plain	57	82.61	42	60.00	21	67.74	11	57.89
Linear	12	17.39	27	38.57	9	29.03	8	42.11
LIN / LIN	0	0.00	0	0.00	1	3.23	0	0.00
LIN > PLN	10	14.49	26	37.14	7	22.58	7	36.84
LIN>LIN/LIN	0	0.00	1	1.43	0	0.00	0	0.00
TOTAL	69		70		31		19	

Table 158: Frequencies of Bowl Section Attributes for Group 1 Sites: Secondary Bowl Decoration (Format 4)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	69	74.19	13	92.86	12	50.00	13	72.22
Punctate	0	0.00	0	0.00	0	0.00	0	0.00
Primary > PUN	24	25.81	1	7.14	12	50.00	5	27.78
TOTAL	93		14		24		18	

Table 159: Frequencies of Bowl Section Attributes for Group 2 Sites: Secondary Bowl Decoration (Format 4)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	63	94.03	53	76.81	27	93.10	18	100.00
Punctate	0	0.00	2	2.90	0	0.00	0	0.00
Primary > PUN	4	5.97	14	20.29	2	6.90	0	0.00
TOTAL	67		69		29		18	

Table 160: Frequencies of Bowl Section Attributes for Group 1 Sites: Bowl Motif (Format 5)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	48	42.86	11	68.75	11	39.29	10	40.00
Simple	50	44.64	5	21.25	16	57.14	8	32.00
Horizontal Diff.	3	2.68	0	0.00	1	3.57	1	4.00
Vert. Diff. Sim.	1	0.89	0	0.00	0	0.00	1	4.00
SIM > HDI	10	8.93	0	0.00	0	0.00	4	16.00
HDI > SIM	0	0.00	0	0.00	0	0.00	1	4.00
TOTAL	112		16		28		25	

Table 161: Frequencies of Bowl Section Attributes for Group 2 Sites: Bowl Motif (Format 5)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	57	82.61	42	60.00	21	67.74	11	57.89
Simple	12	17.39	27	38.57	9	29.03	8	42.11
Horizontal Diff.	0	0.00	0	0.00	1	3.23	0	0.00
SIM > HDI	0	0.00	1	1.43	0	0.00	0	0.00
TOTAL	69		70		31		19	

Table 162: Frequencies of Bowl Section Attributes for Group 1 Sites: Secondary Bowl Decoration (Format 5)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	69	74.19	13	92.86	12	50.00	13	72.22
Simple	0	0.00	0	0.00	0	0.00	0	0.00
Vert. Positioning	24	25.81	1	7.14	12	50.00	5	27.78
TOTAL	93		14		24		18	

Table 163: Frequencies of Bowl Section Attributes for Group 2 Sites: Secondary Bowl Decoration (Format 5)

	SITES							
	Chypchar		Pipeline		Campbell		Milton	
ATTRIBUTES	N	%	N	%	N	%	N	%
Plain	63	94.03	53	76.81	27	93.10	18	100.00
Simple	0	0.00	2	2.90	0	0.00	0	0.00
Vert. Positioning	4	5.97	14	20.29	2	6.90	0	0.00
TOTAL	67		69		29		18	

Table 164: Frequencies of Bowl Section Attributes for Group 1 Sites: Bowl Motif (Format 6)

	SITES							
	Rife		Unick		Cr. Lake		Van Eden	
ATTRIBUTES	N	%	N	%	N	%	N	%
Absent	48	42.86	11	68.75	11	39.29	10	40.00
Present	64	57.14	5	31.25	17	60.71	15	60.00
TOTAL	112		12		28		25	

Table 165: Frequencies of Bowl Section Attributes for Group 2 Sites: Bowl Motif (Format 6)

ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Absent	57	82.61	42	60.00	21	67.74	11	57.89
Present	12	17.39	28	40.00	10	32.26	8	42.11
TOTAL	69		70		31		19	

Table 166: Frequencies of Bowl Section Attributes for Group 1 Sites: Secondary Bowl Decoration (Format 6)

ATTRIBUTES	SITES Rife N	%	Unick N	%	Cr. Lake N	%	Van Eden N	%
Absent	69	74.19	13	92.86	12	50.00	13	72.22
Present	24	25.81	1	7.14	12	50.00	5	27.78
TOTAL	93		14		24		18	

Table 167: Frequencies of Bowl Section Attributes for Group 2 Sites: Secondary Bowl Decoration (Format 6)

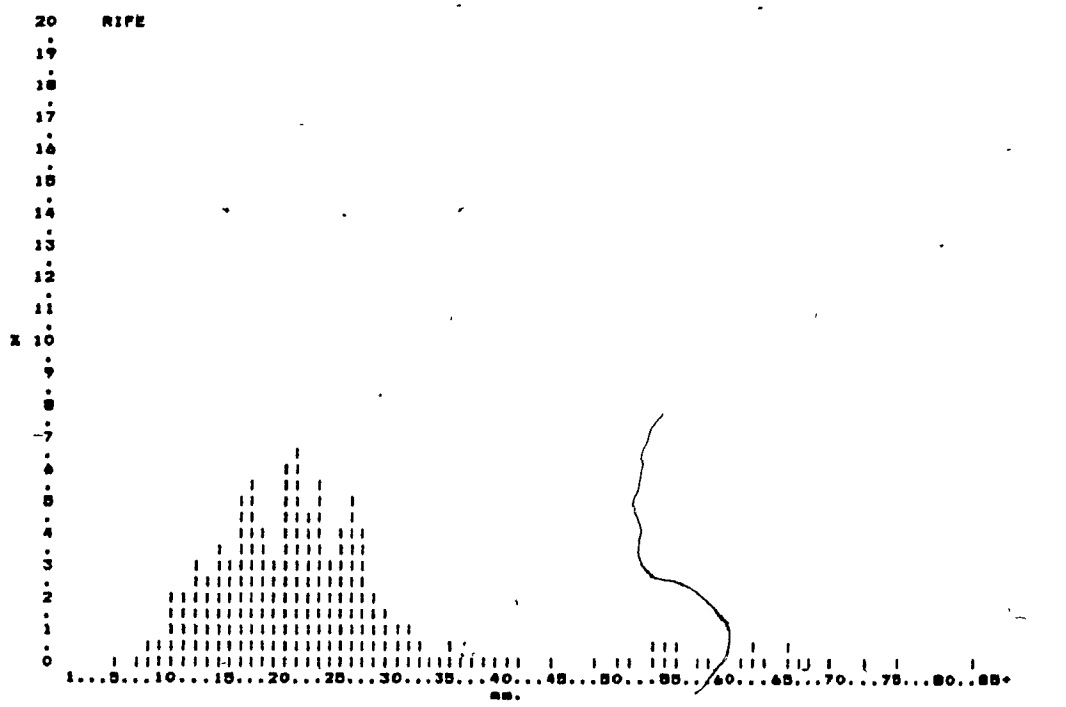
ATTRIBUTES	SITES Chypchar N	%	Pipeline N	%	Campbell N	%	Milton N	%
Absent	63	94.03	53	76.81	27	93.10	18	100.00
Present	4	5.97	16	23.19	2	6.90	0	0.00
TOTAL	67		69		29		18	

The next stage in the study was to begin searching for useful patterns of variation in the data base. This search was conducted by organizing the analysis into a number of steps that examined the nature of the pattern exhibited by the increasingly more complex analytical entities illustrated in Figure 1. I began with the variation demonstrated by attributes within the context of variables. As I have stated previously (Smith 1983) and in Chapter 3.0 above, I agree with

Wright's and Ramsden's contention that attributes are valuable analytical entities. I do not agree, however, that useful patterning in Iroquoian ceramic data is best identified at the level of individual attributes. In fact, I argue that to examine an attribute (i.e. a value of a variable) separately from other attributes of the same variable, is to isolate that attribute from the context within which it acquires much of its meaning. For this reason, I consider the context of an attribute to be as important, if not more important, than its individual variation. Important substantive examples illustrating and supporting this argument will be discussed below.

Accordingly, for the first step I examined attribute variation within the context of a variable. This was done, for the most part, by examining attribute variation in comparison to that of other values of the same variable, and then investigating any changes that occurred in this variation from site to site. The simplest and most straightforward way to do this was to graph the percentages of the various values of the variables in such a way as to facilitate their comparison. I chose basic histograms (or bar graphs) because they can be easily compared to one another. Histograms are particularly useful for comparing variation in interval and ordinal variables, but are also valid, if less useful, for nominal variables. Histograms were constructed for each variable except those that had two variables only, for which the variability is readily apparent in a table. These graphs are presented in Figures 17 - 57.

Figure 17: Histograms of Rim Section Attributes
Collar Height (Format 1)



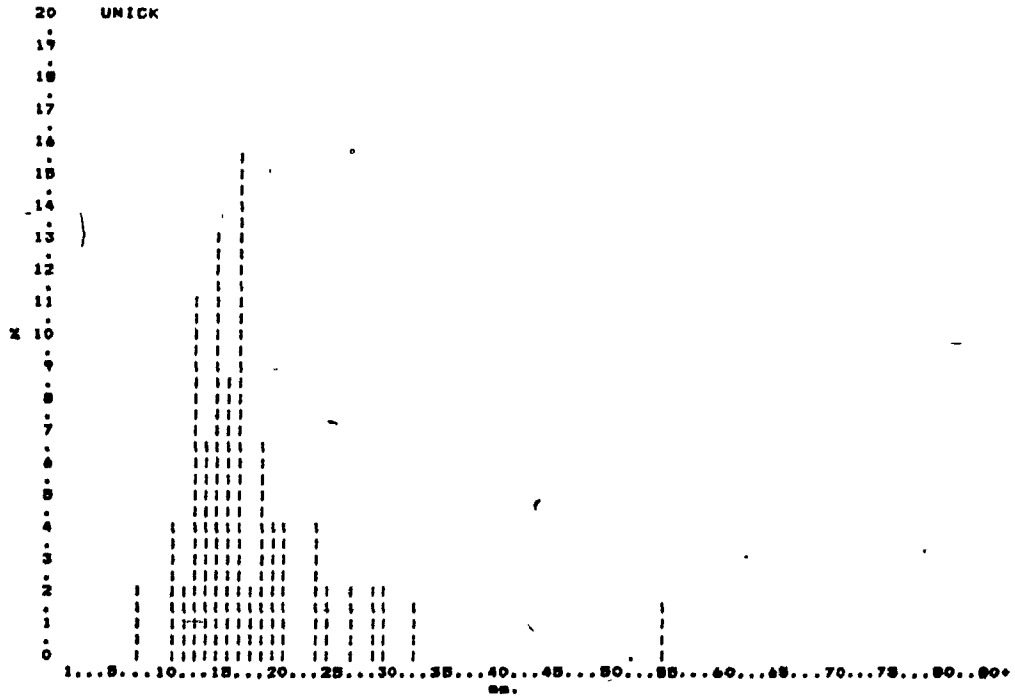
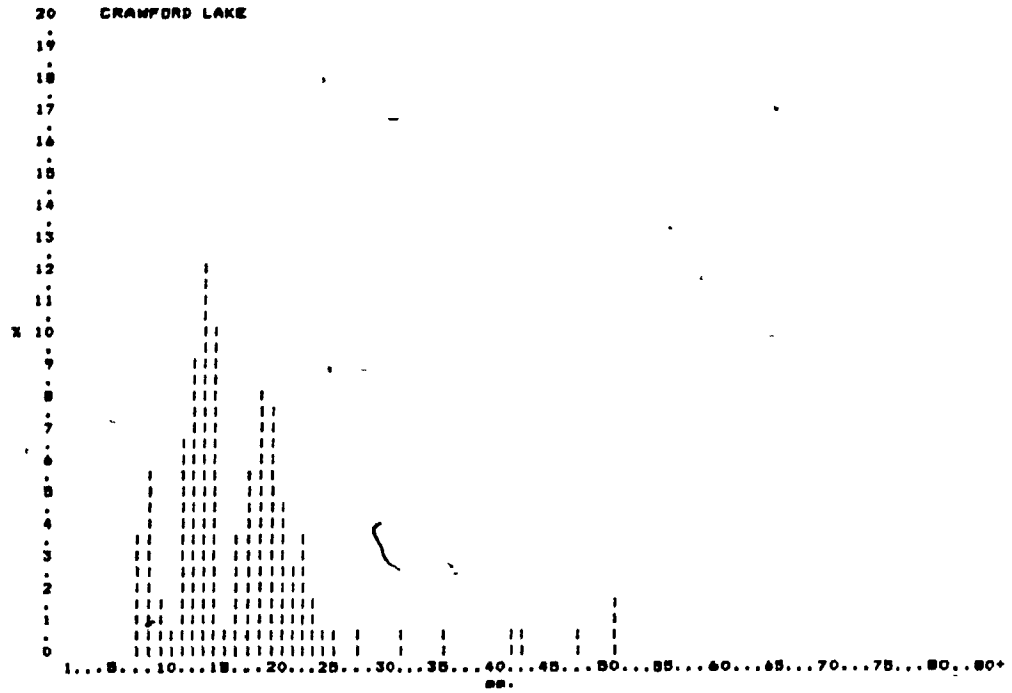


Figure 17: Histograms of Rim Section Attributes
(cont.) Collar Height (Format 1)



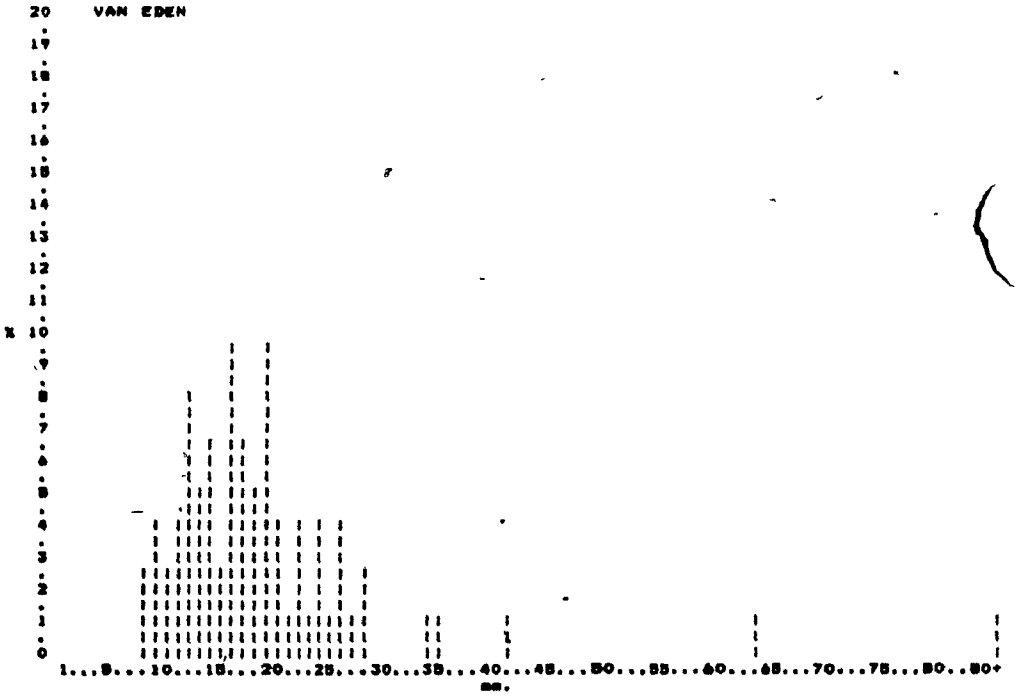
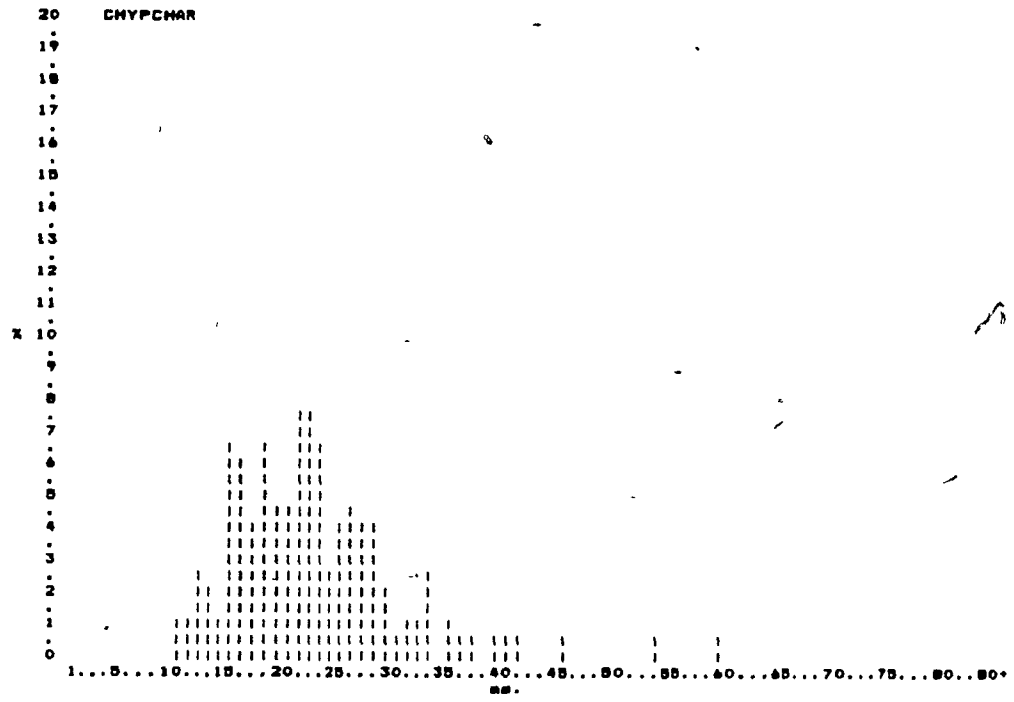


Figure 17: Histograms of Rim Section Attributes
(cont.) Collar Height (Format 1)



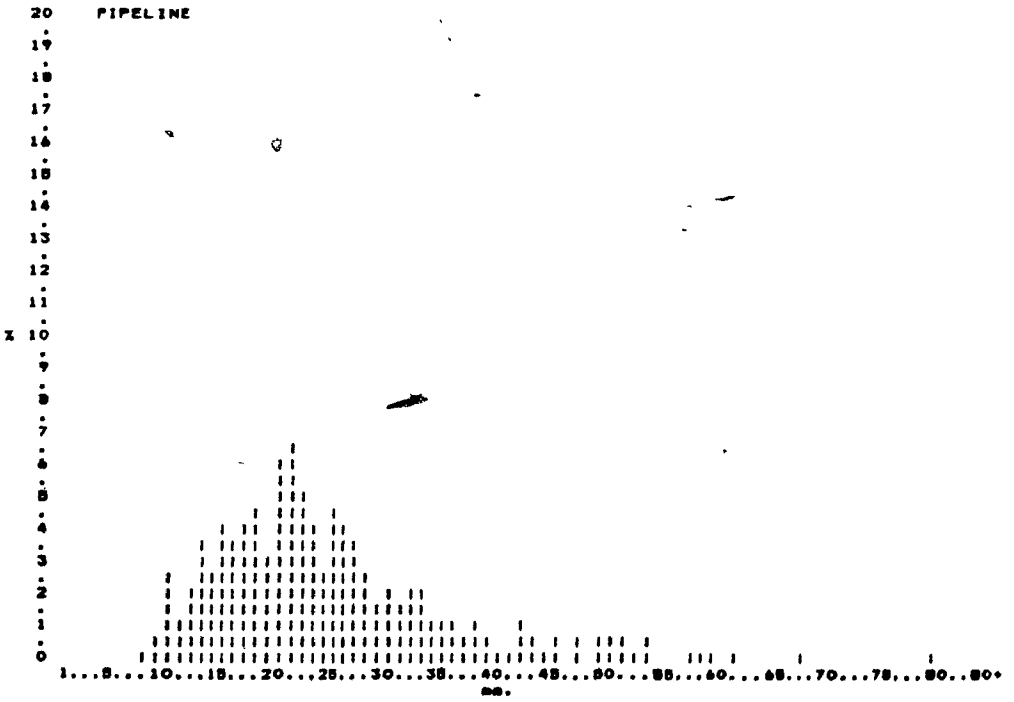
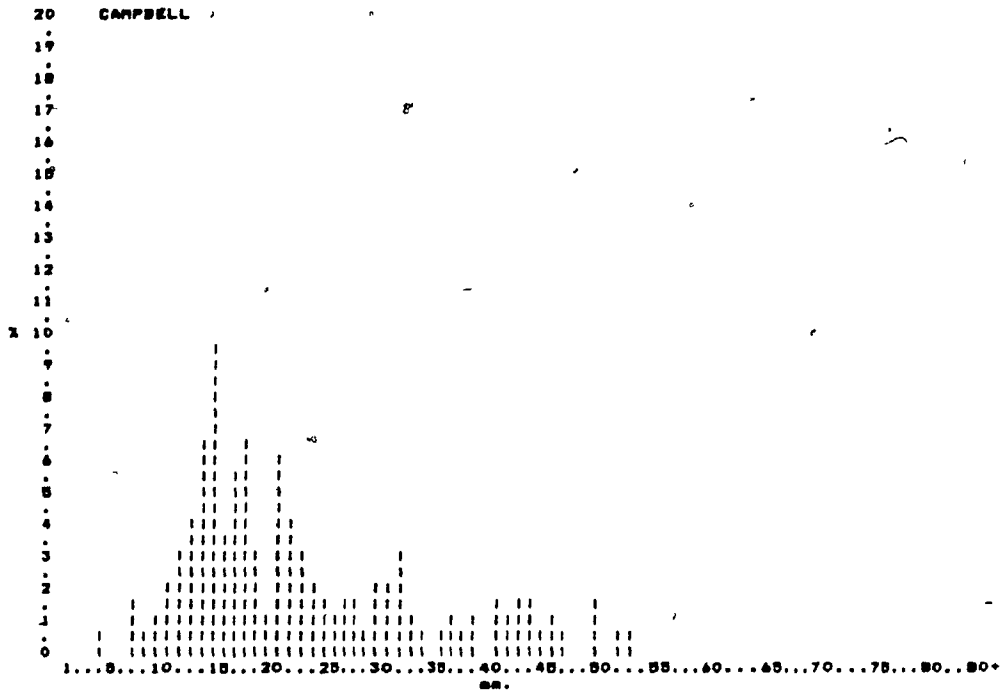


Figure 17: Histograms of Rim Section Attributes
(cont.) Collar Height (Format 1)



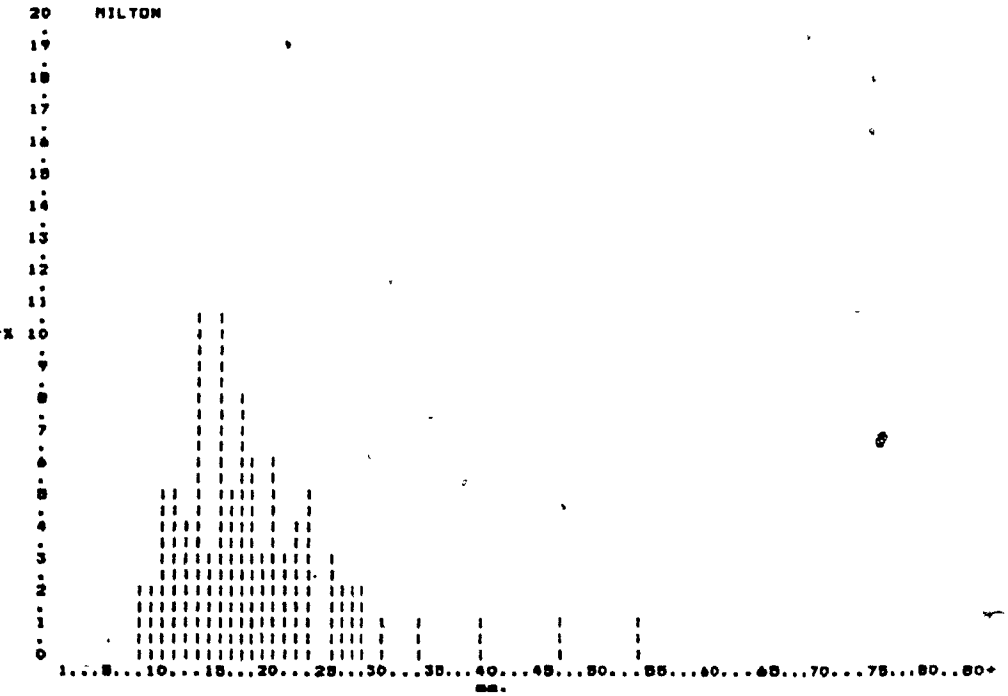


Figure 18: Histograms of Rim Section Attributes
Lip Thickness (Format 1)

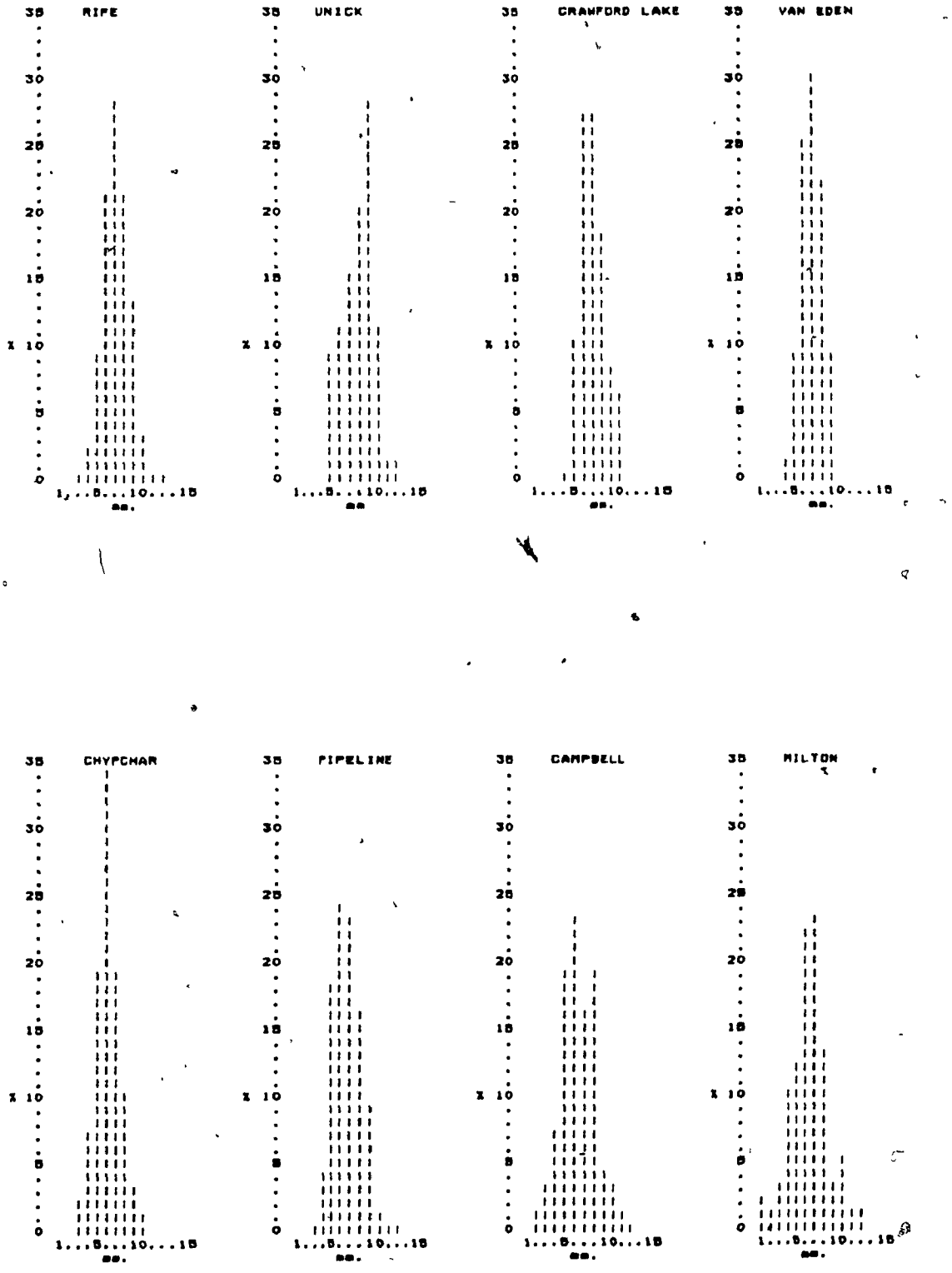


Figure 19: Histograms of Rim Section Attributes
Collar Base Thickness (Format 1)

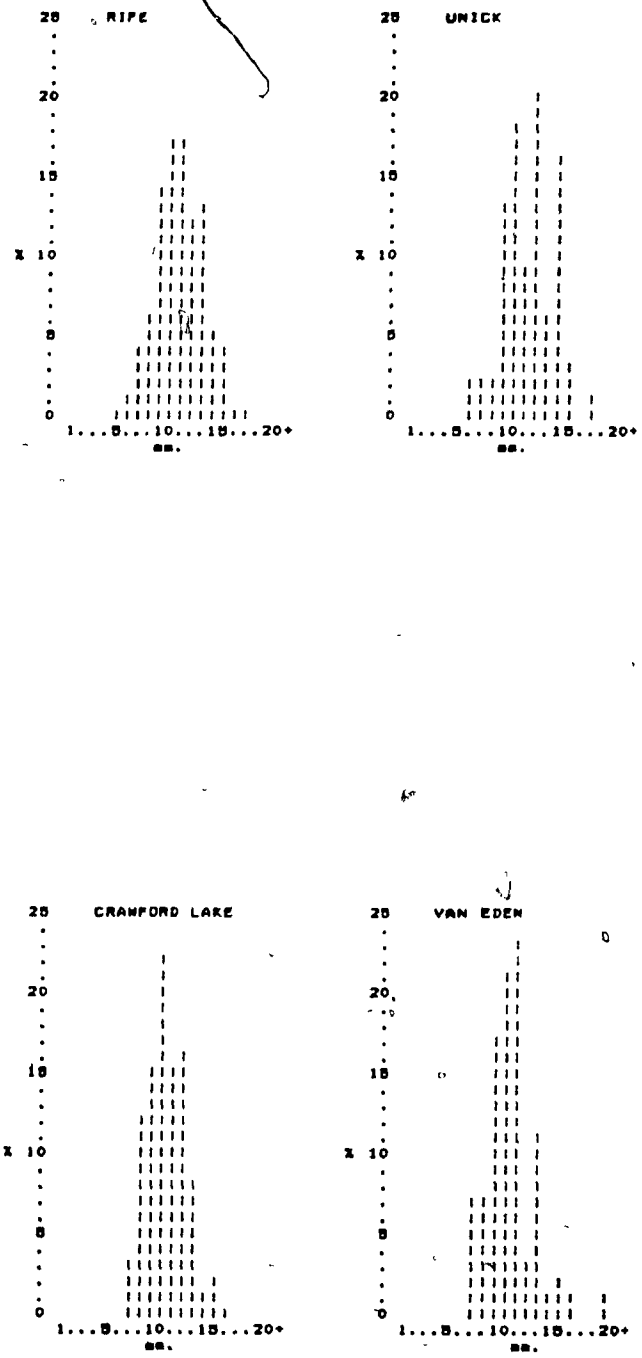
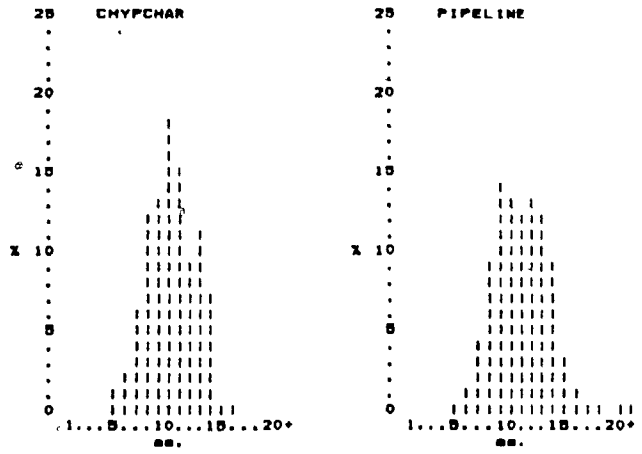


Figure 19: Histograms of Rim Section Attributes
(cont.) Collar Base Thickness (Format 1)



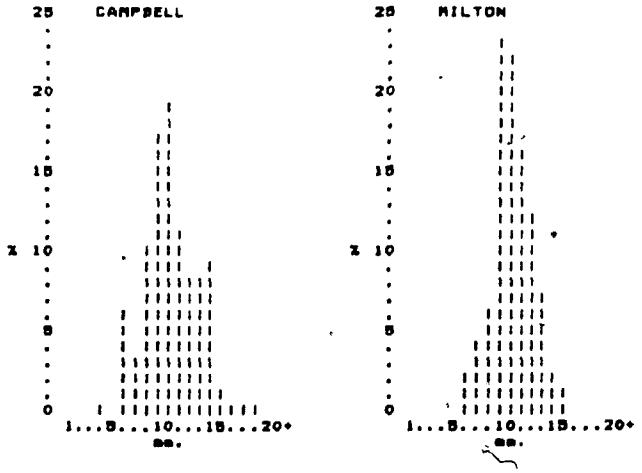
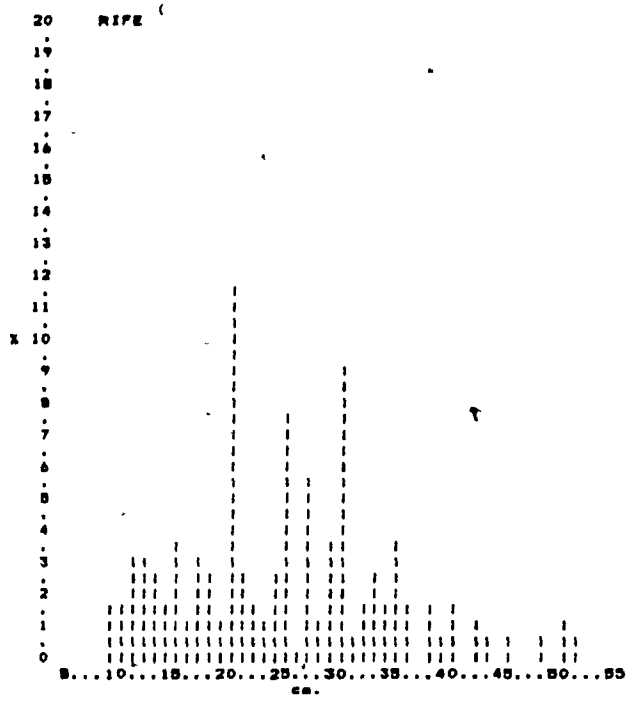


Figure 20: Histograms of Rim Section Attributes
Rim Diameter at Lip (Format 1)



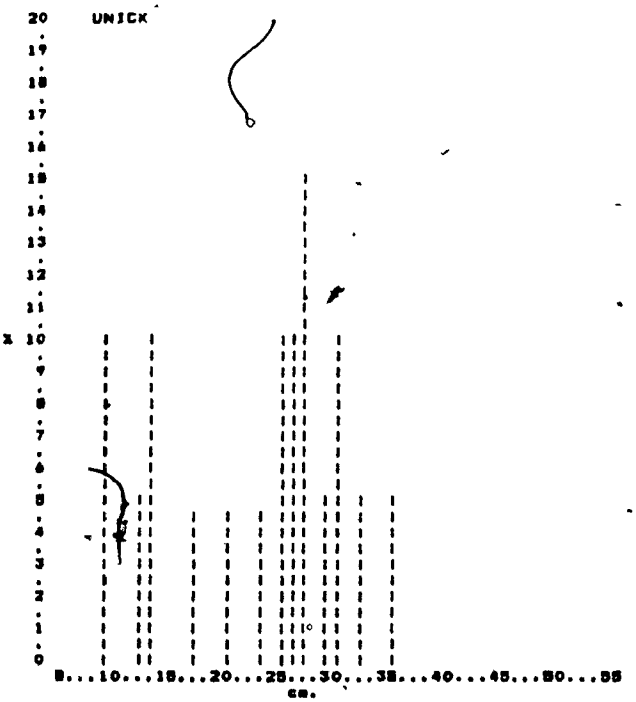
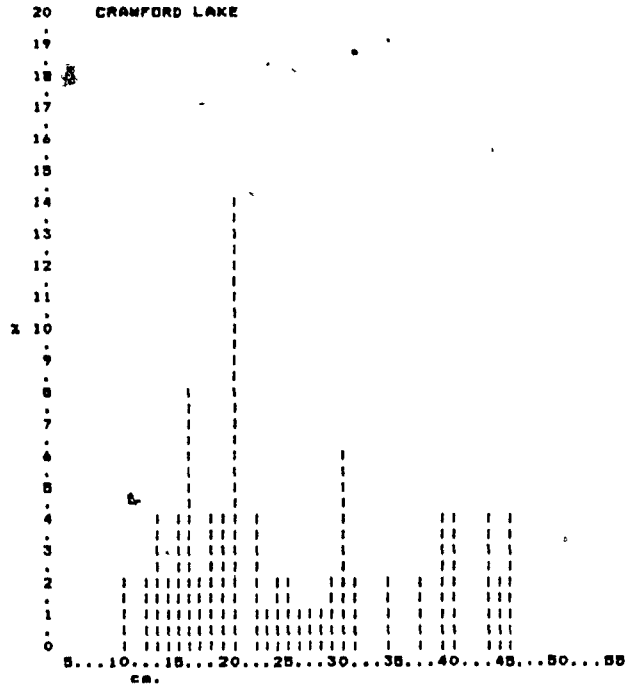


Figure 20: Histograms of Rim Section Attributes
(cont.) Rim Diameter at Lip (Format 1)



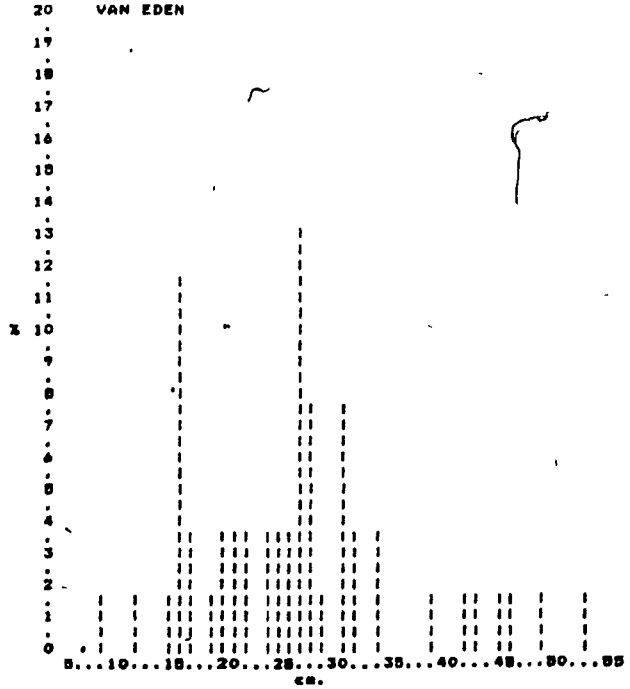
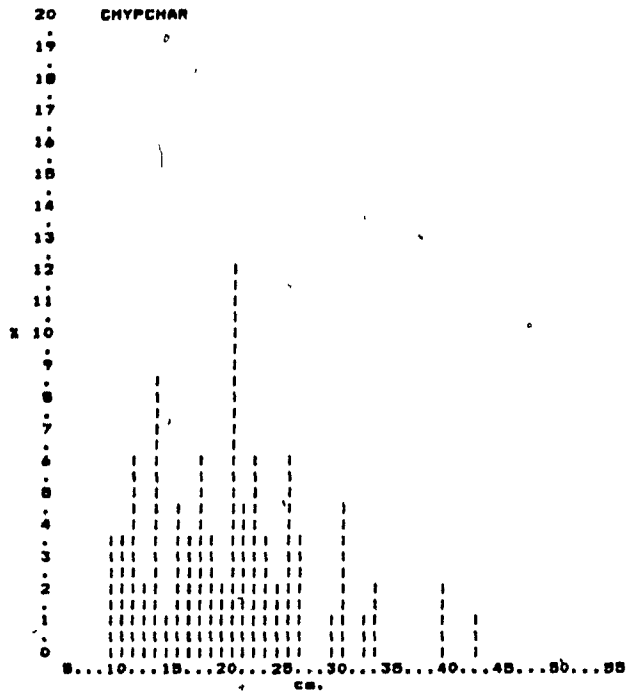


Figure 20: Histograms of Rim Section Attributes
(cont.) Rim Diameter at Lip (Format 1)



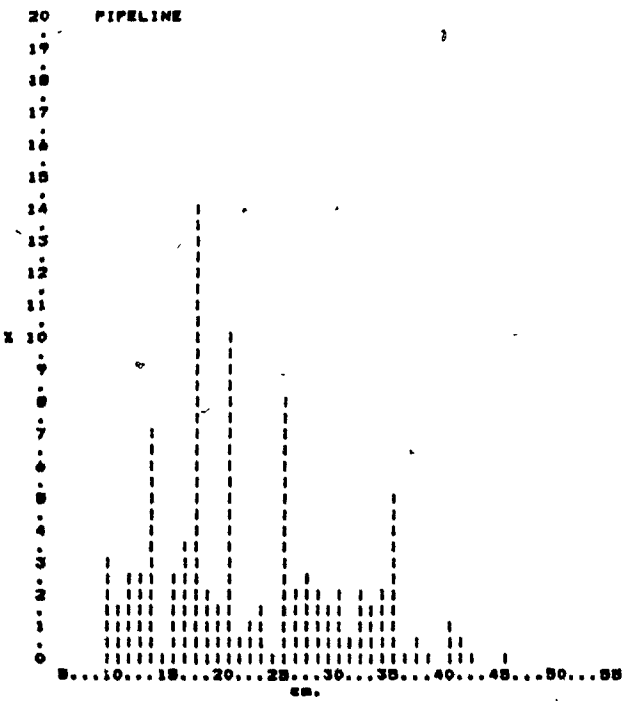
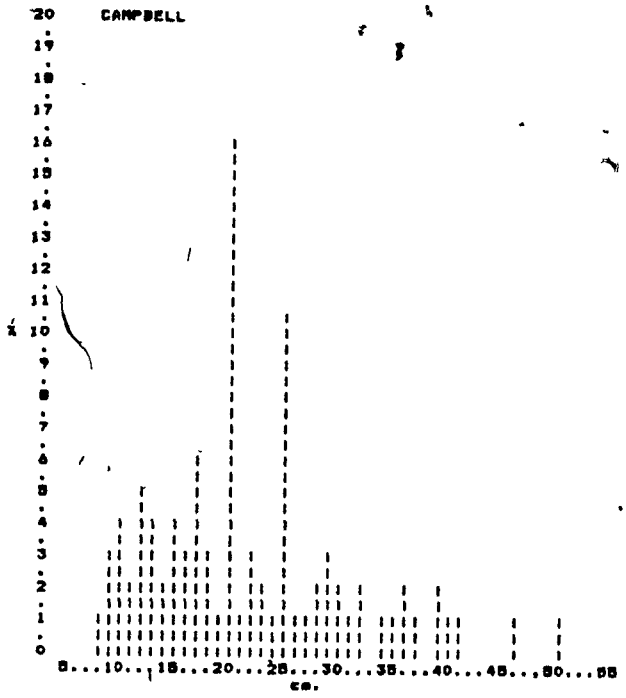


Figure 20: Histograms of Rim Section Attributes
(cont.) Rim Diameter at Lip (Format 1)



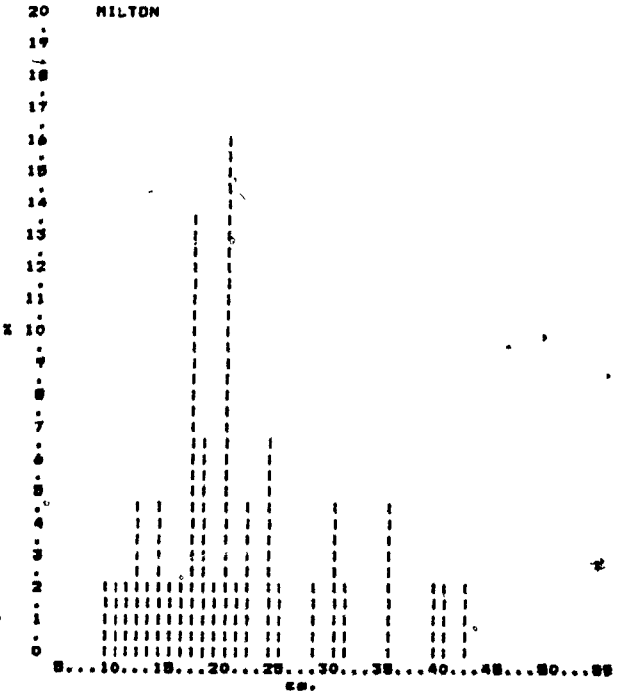
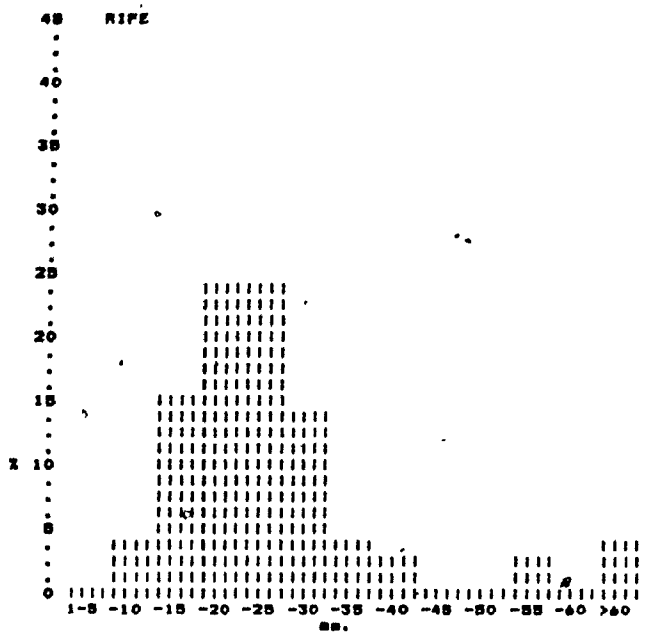


Figure 21: Histograms of Rim Section Attributes
Collar Height (Format 2)



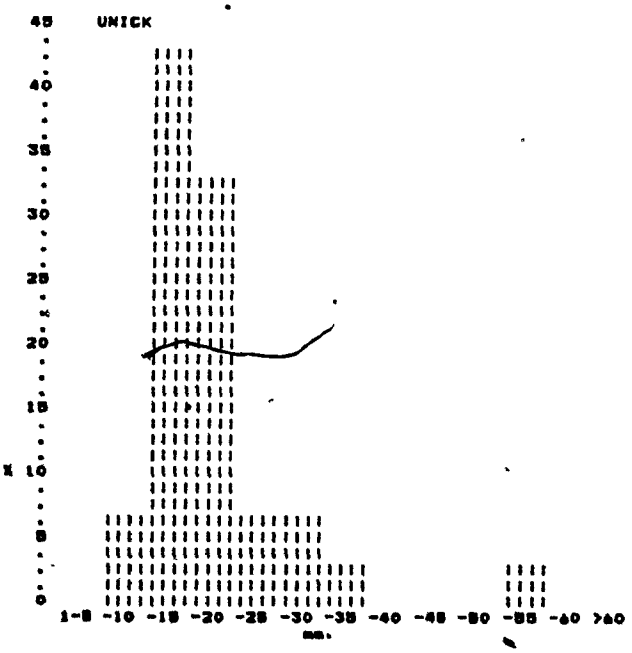
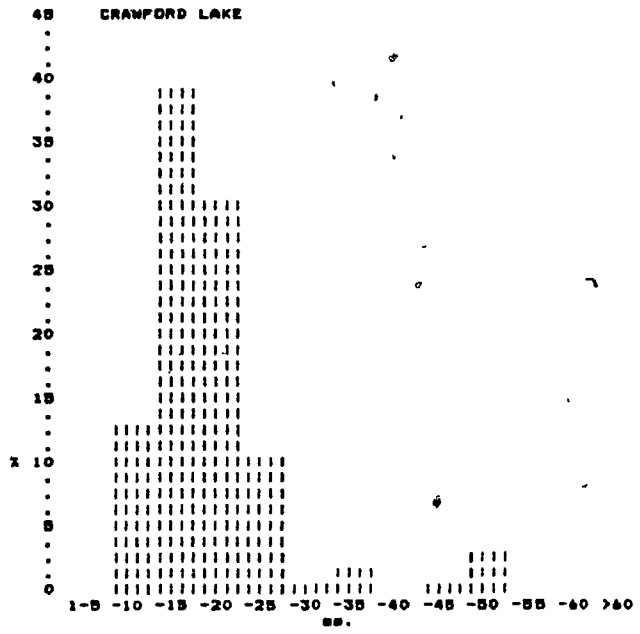


Figure 21: Histograms of Rim Section Attributes
(cont.) Collar Height (Format 2)



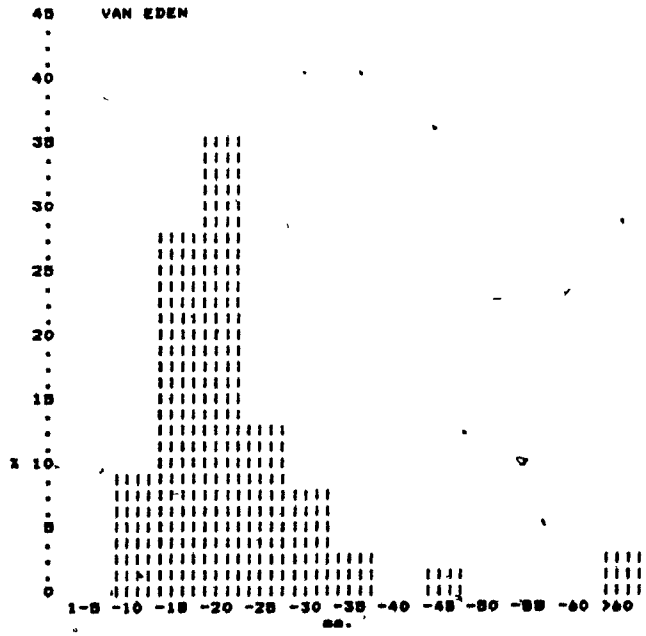
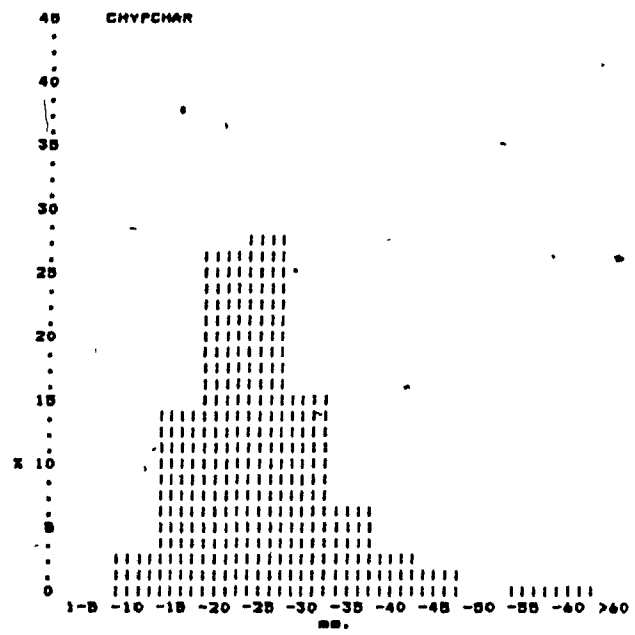


Figure 21: Histograms of Rim Section Attributes
(cont.) Collar Height (Format 2)



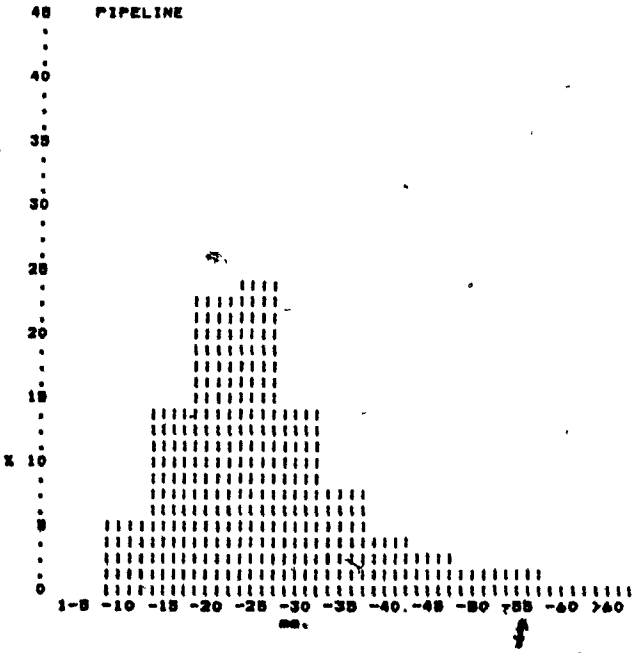
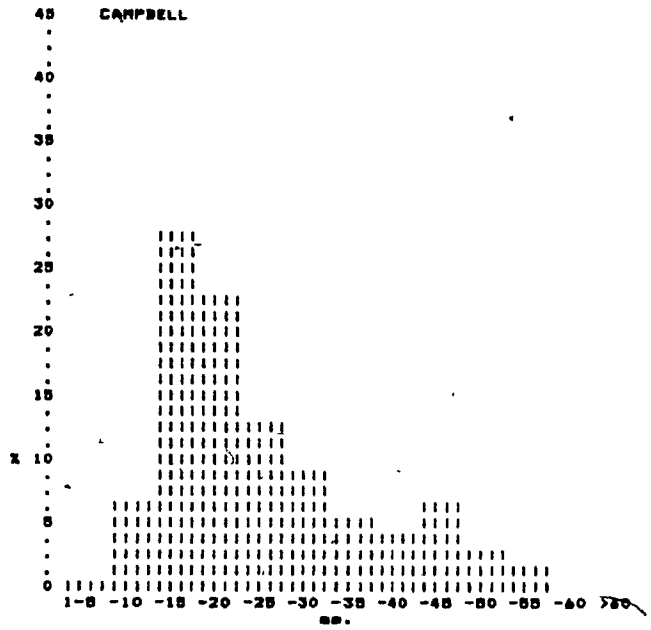


Figure 21: Histograms of Rim Section Attributes
(cont.) Collar Height (Format 2)



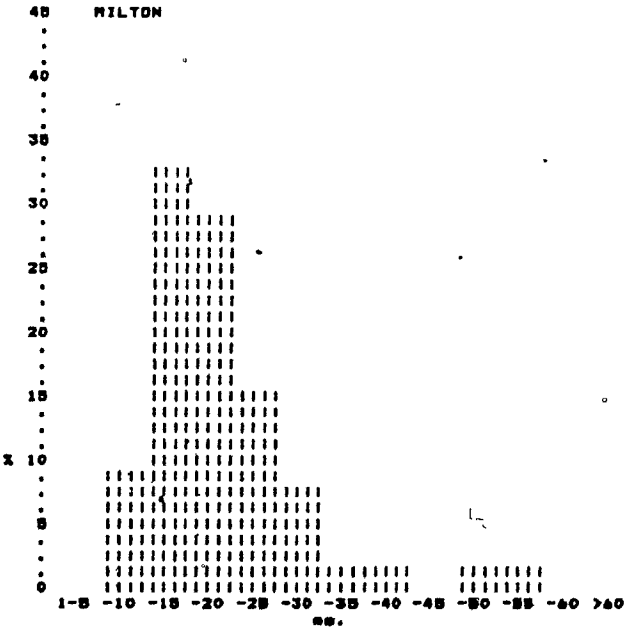


Figure 22: Histograms of Rim Section Attributes
Lip Thickness (Format 2)

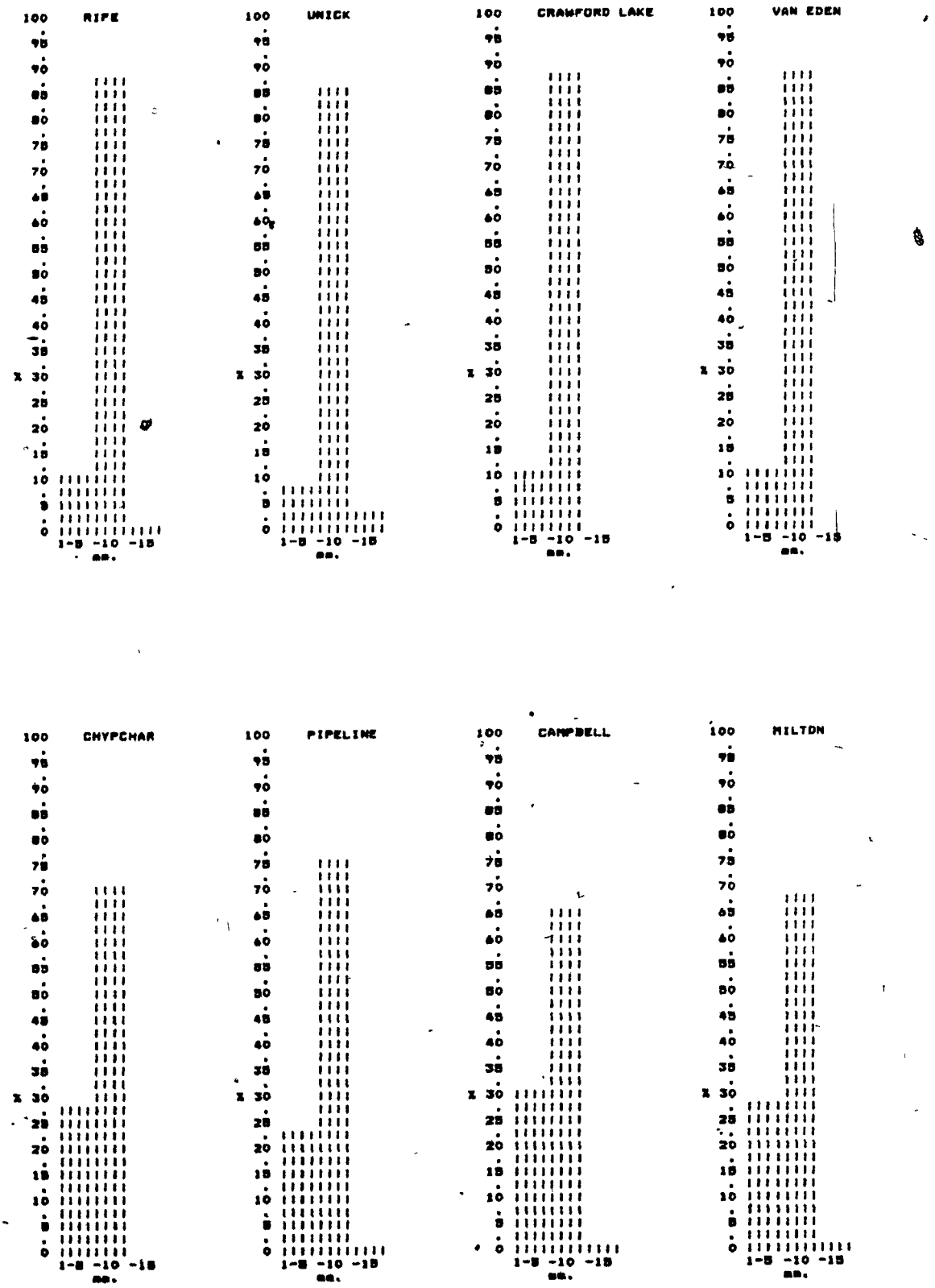
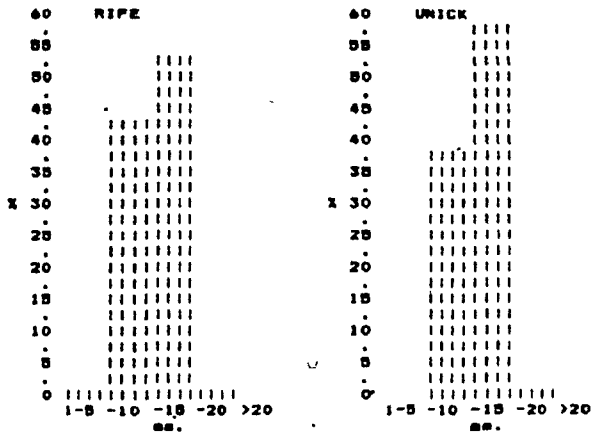


Figure 23: Histograms of Rim Section Attributes
Collar Base Thickness (Format 2)



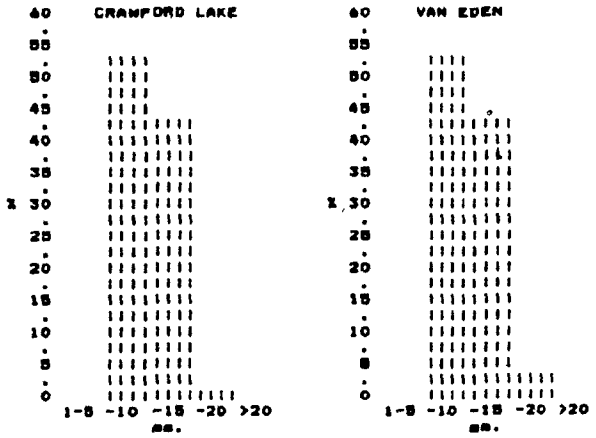
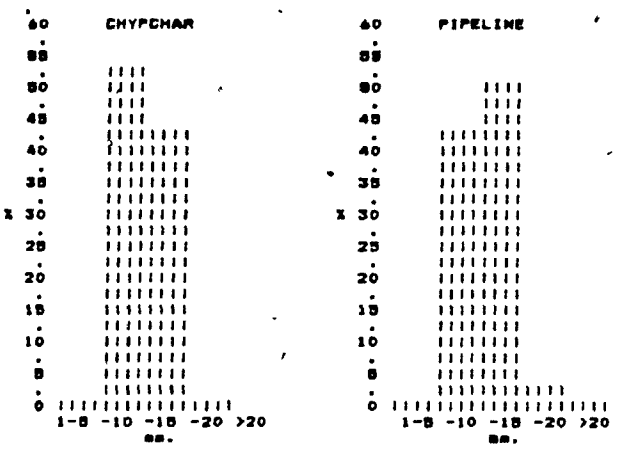


Figure 23: Histograms of Rim Section Attributes
(cont.) Collar Base Thickness (Format 2)



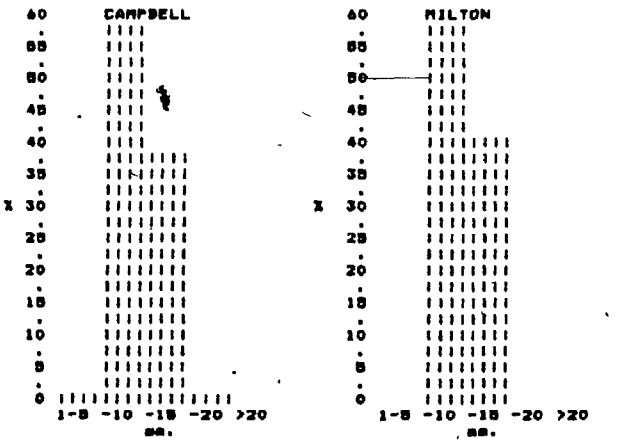
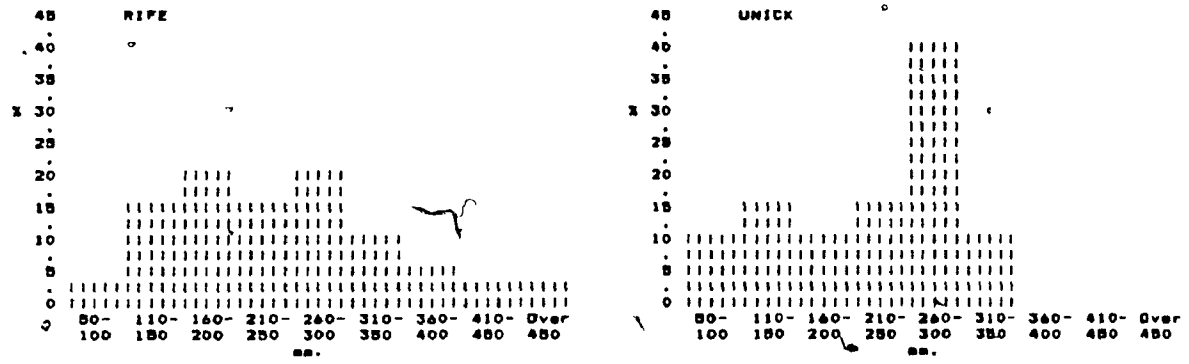


Figure 24: Histograms of Rim Section Attributes
Rim Diameter at Lip (Format 2)



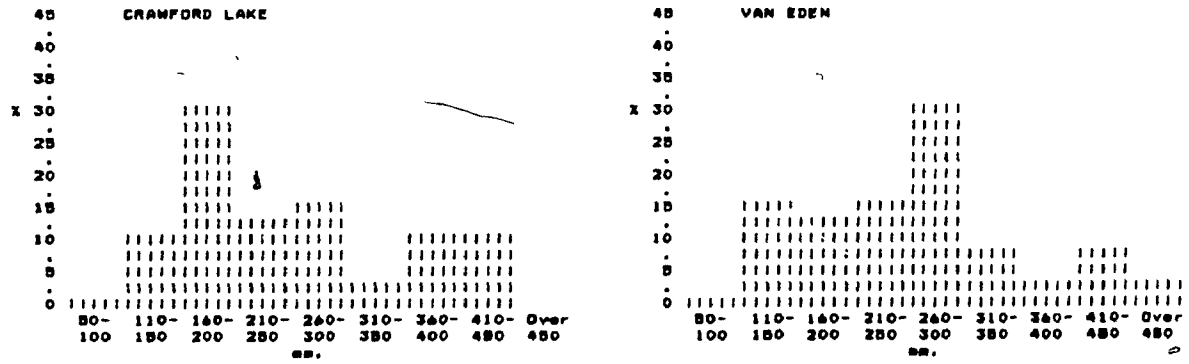
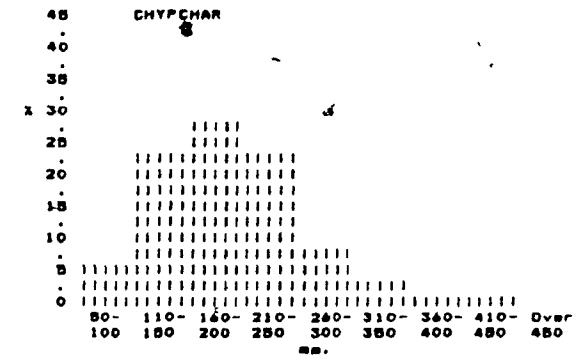
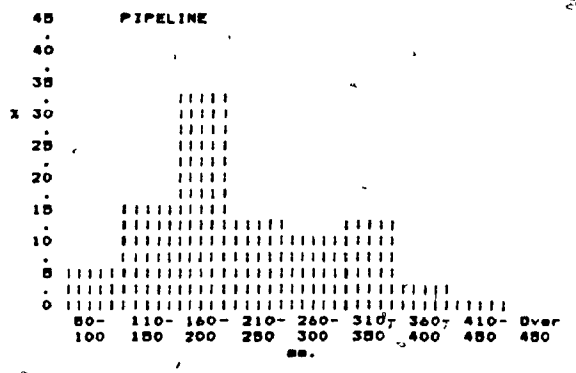
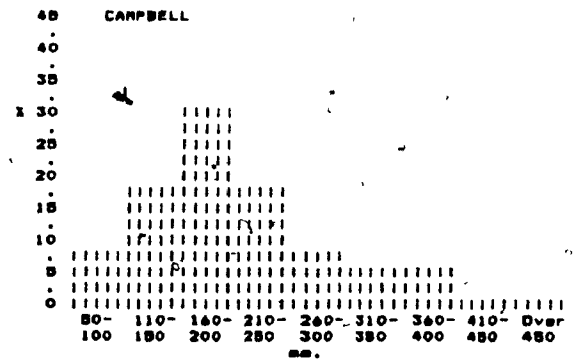


Figure 24: Histograms of Rim Section Attributes
(cont.) Rim Diameter at Lip (Format 2)







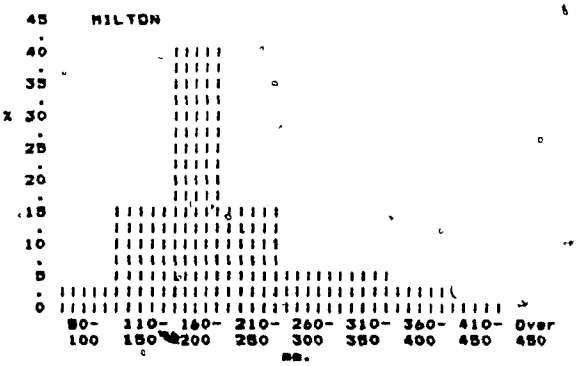


Figure 25: Histograms of Rim Section Attributes
Interior Rim Motif (Format 2)

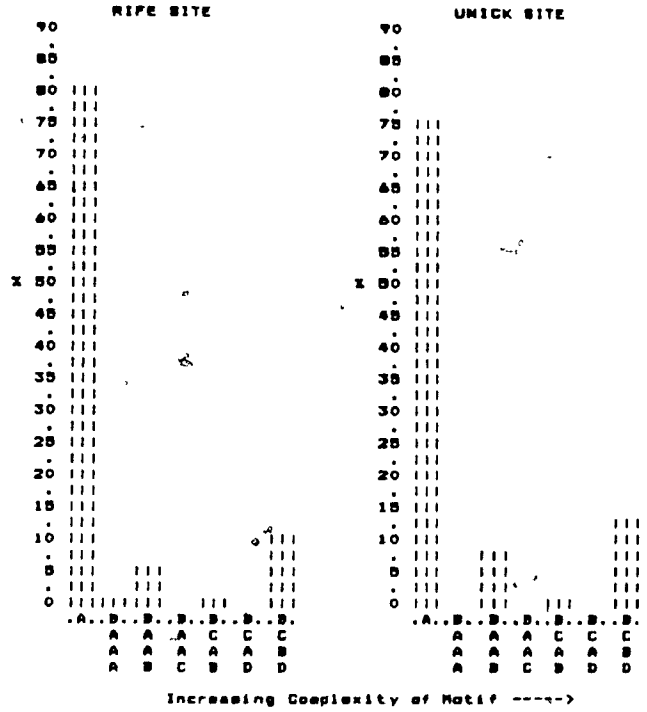


Figure 25: Histograms of Rim Section Attributes
(cont.) Interior Rim Motif (Format 2)

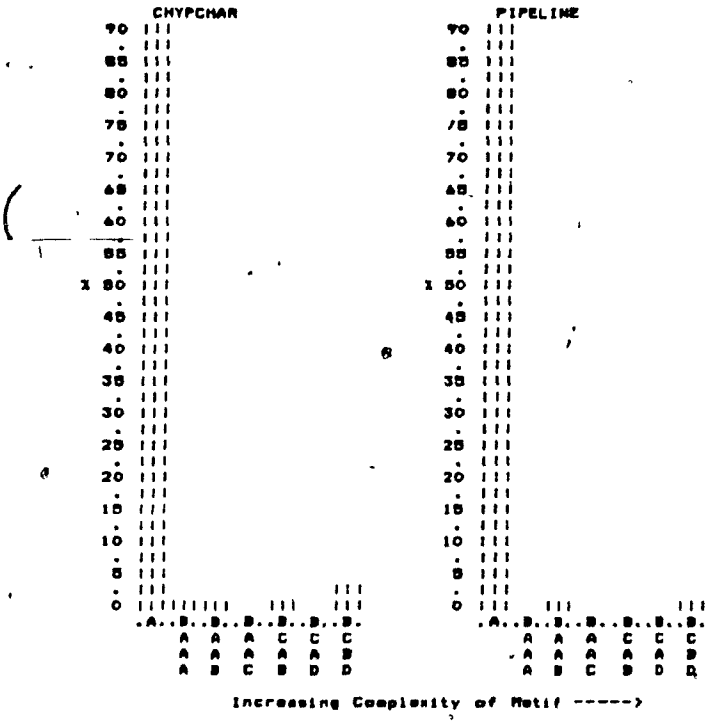


Figure 26: Histograms of Rim Section Attributes
Lip Motif (Format 2)

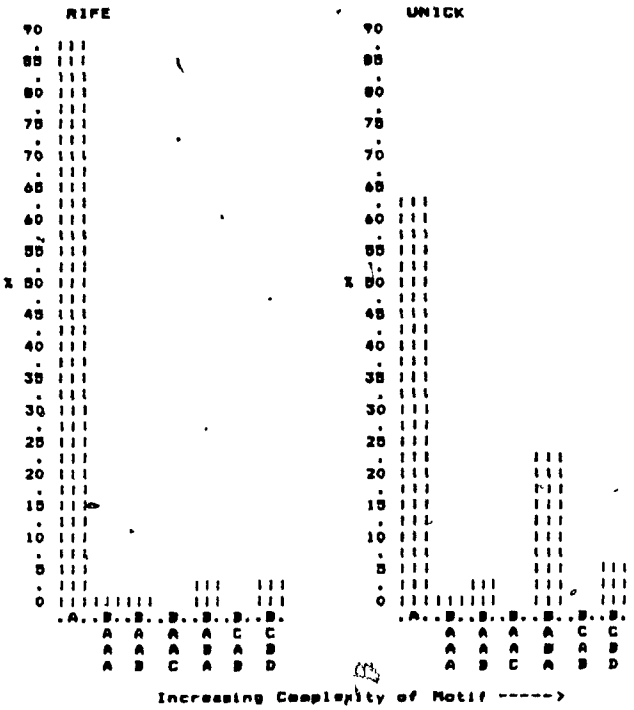


Figure 26: Histograms of Rim Section Attributes
(cont.) Lip Motif (Format 2)

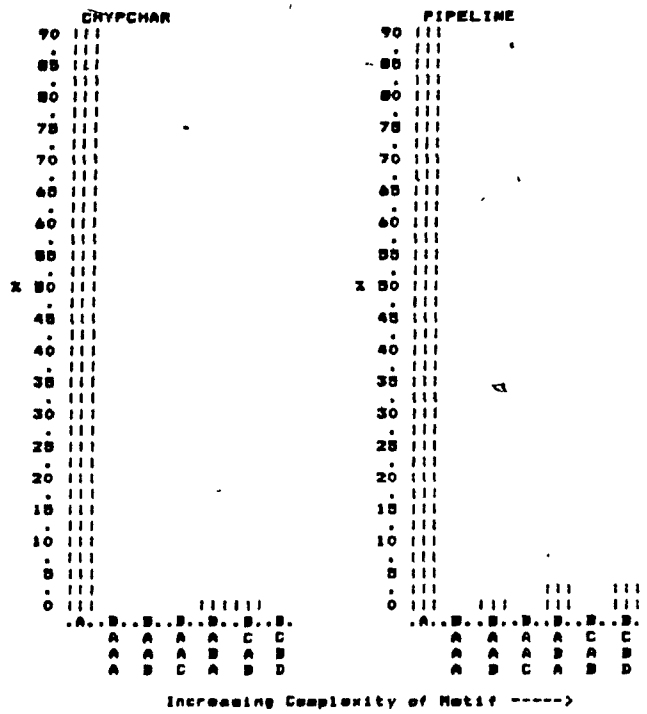


Figure 27: Histograms of Rim Section Attributes
Upper Rim Motif (Format 2)

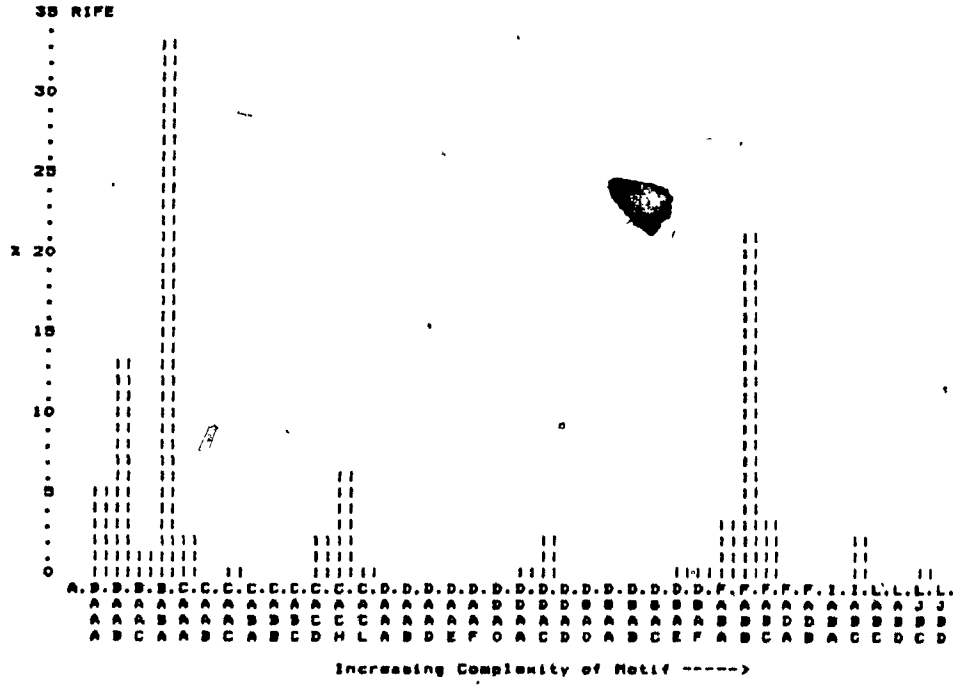
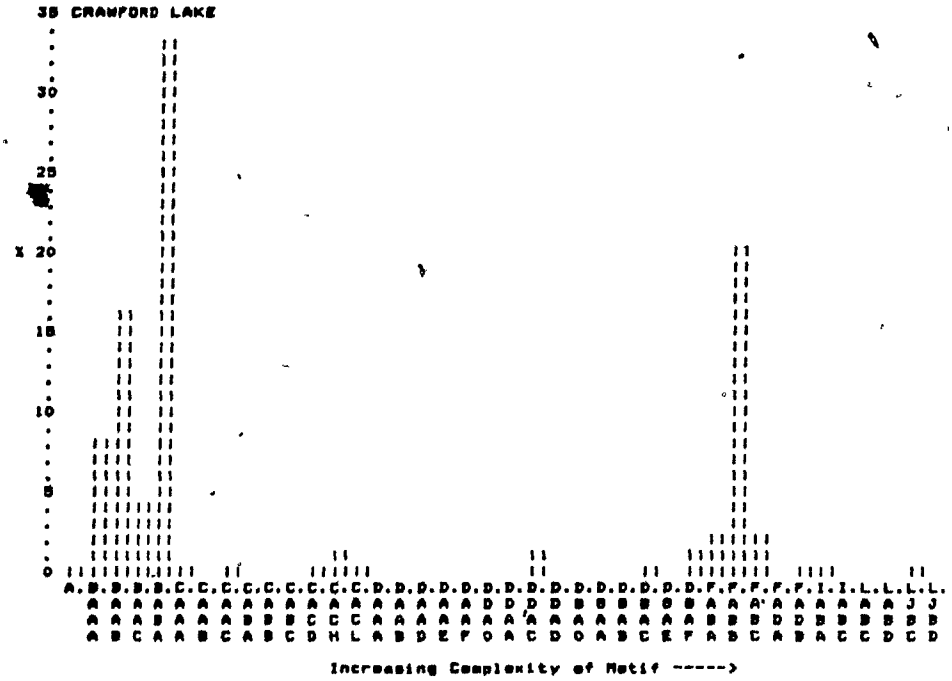


Figure 27: Histograms of Rim Section Attributes
(cont.) Upper Rim Motif (Format 2)



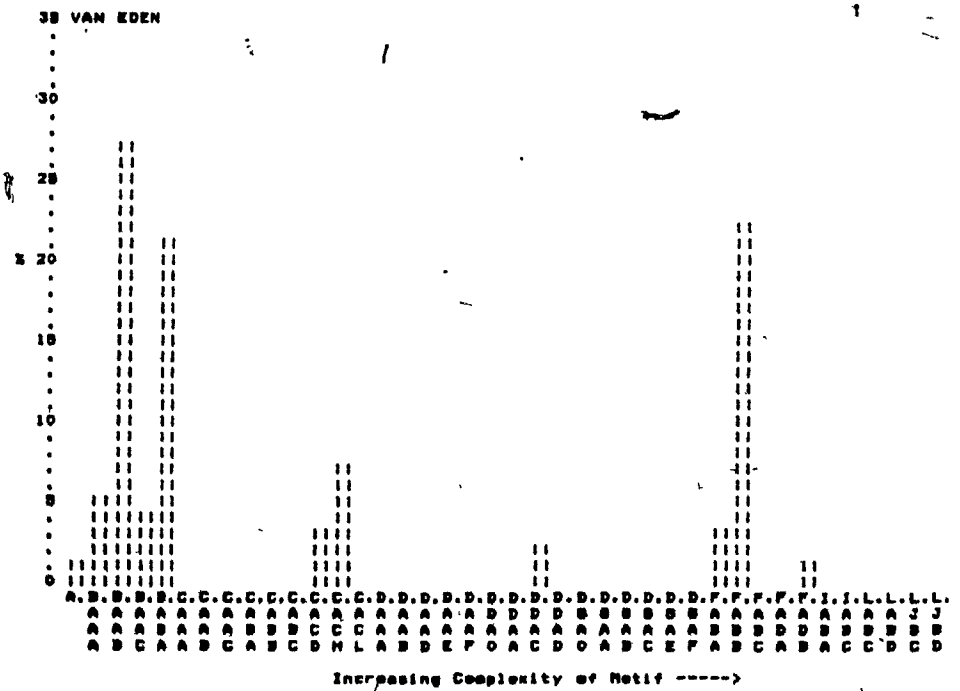
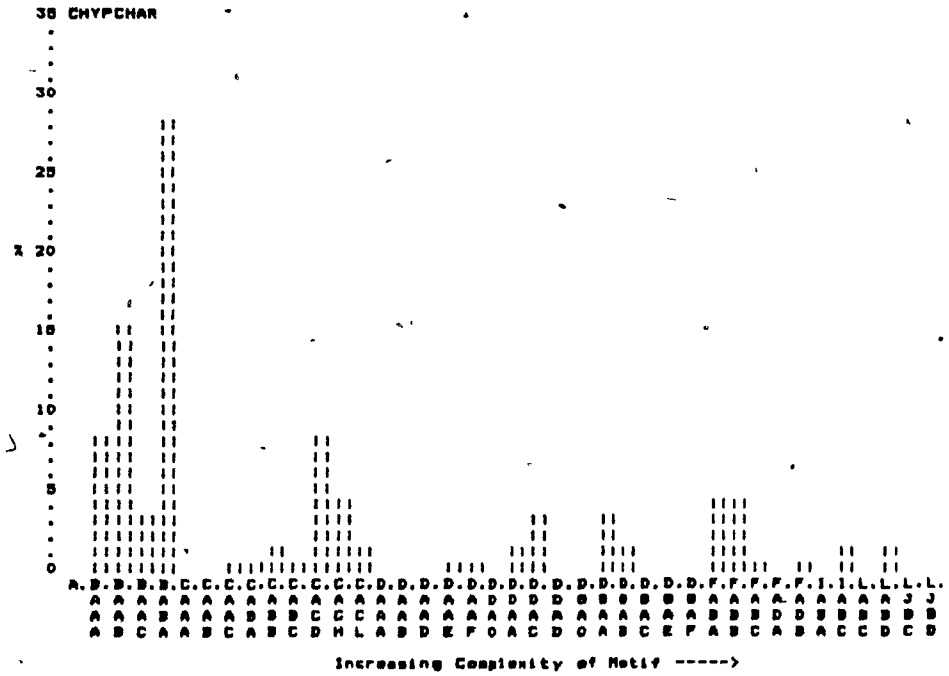


Figure 27: Histograms of Rim Section Attributes
(cont.) Upper Rim Motif (Format 2)



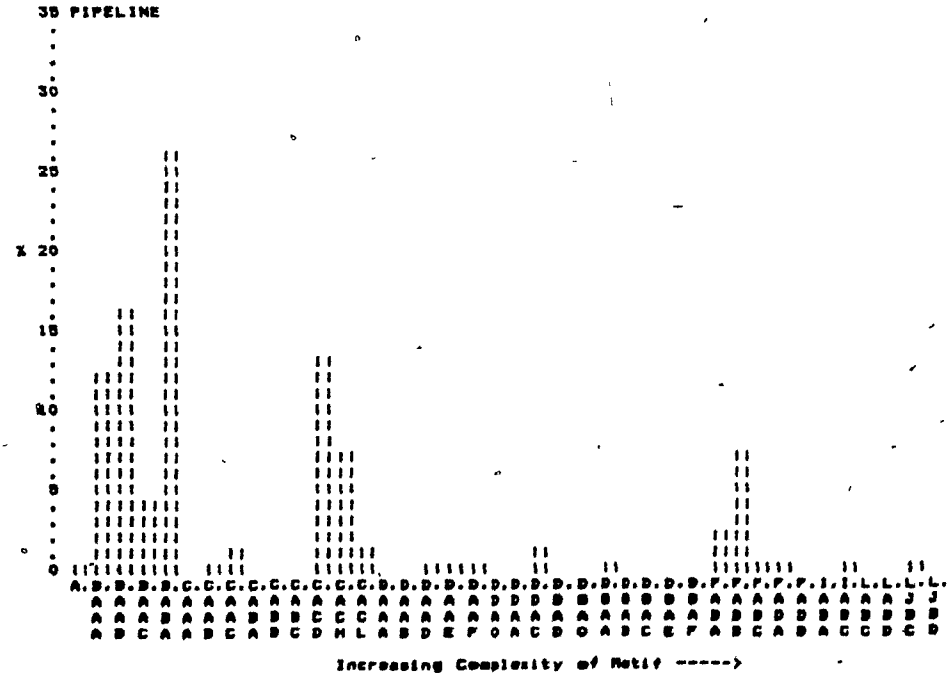


Figure 27: Histograms of Rim Section Attributes
(cont.) Upper Rim Motif (Format 2)

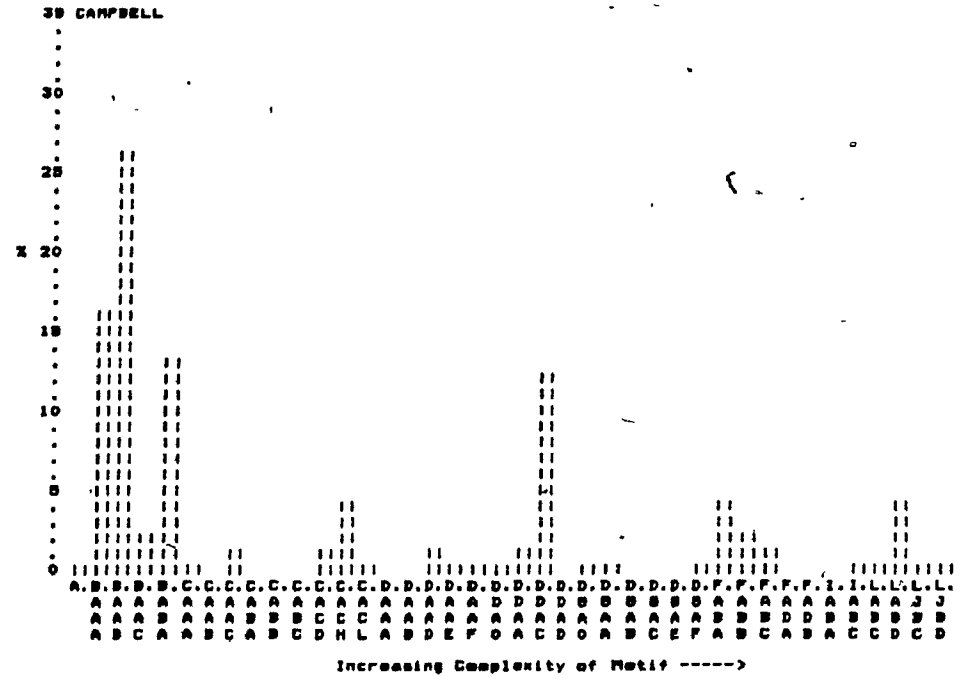


Figure 28: Histograms of Rim Section Attributes
Secondary Rim Decoration (Format 2)

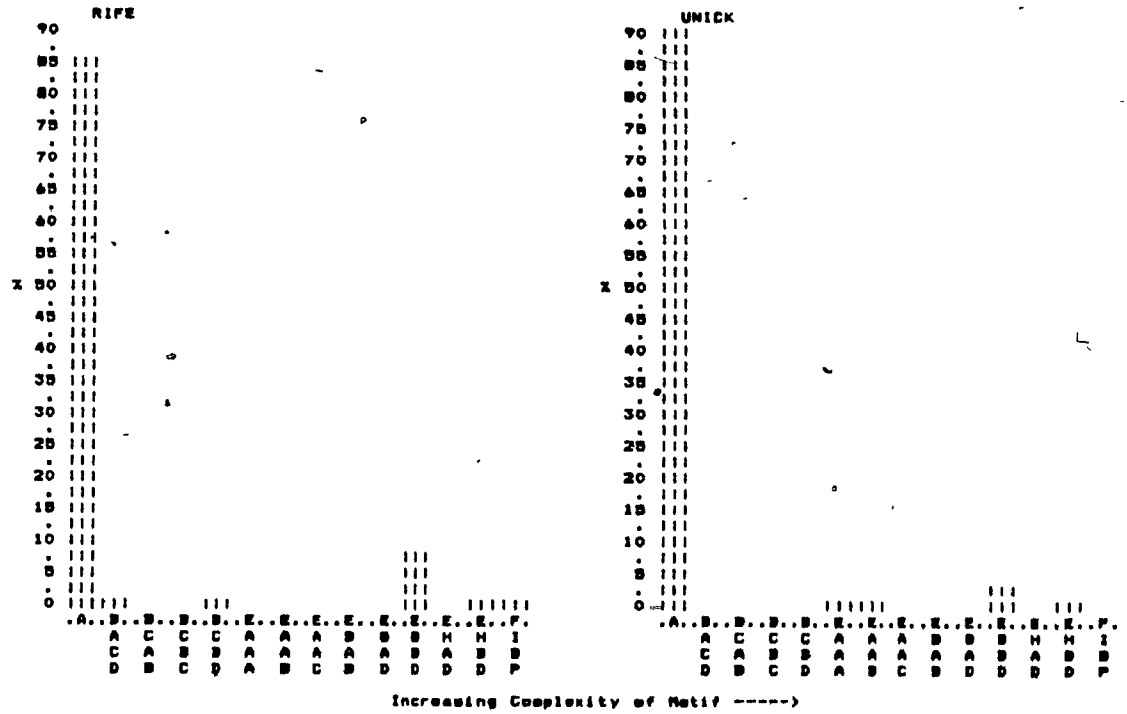


Figure 28: Histograms of Rim Section Attributes
(cont.) Secondary Rim Decoration (Format 2)

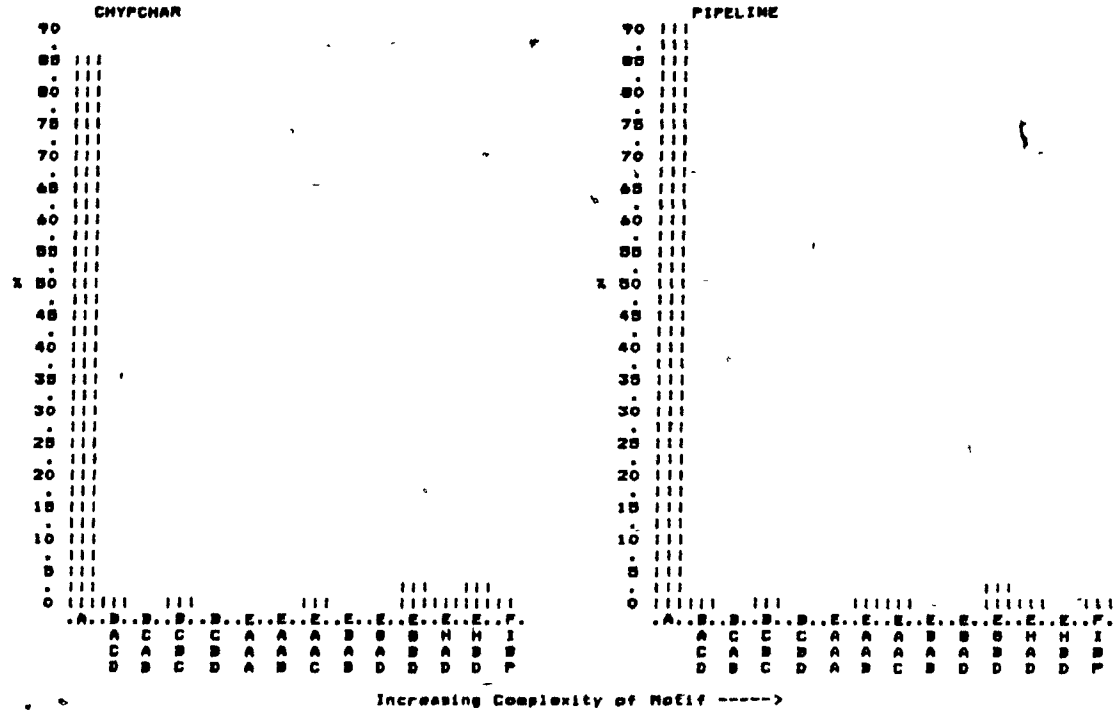


Figure 29: Histograms of Rim Section Attributes
Neck Motif (Format 2)

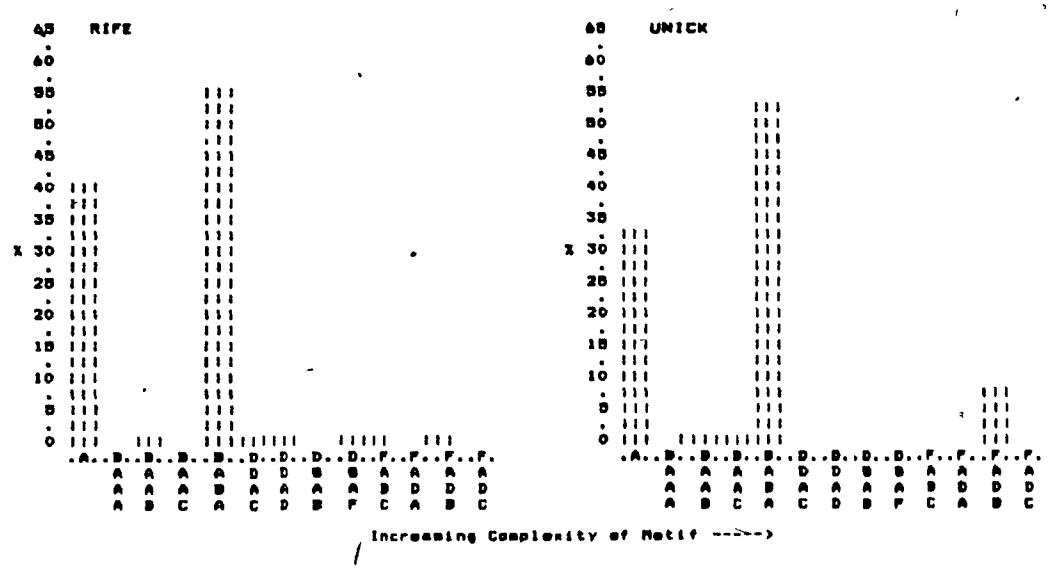
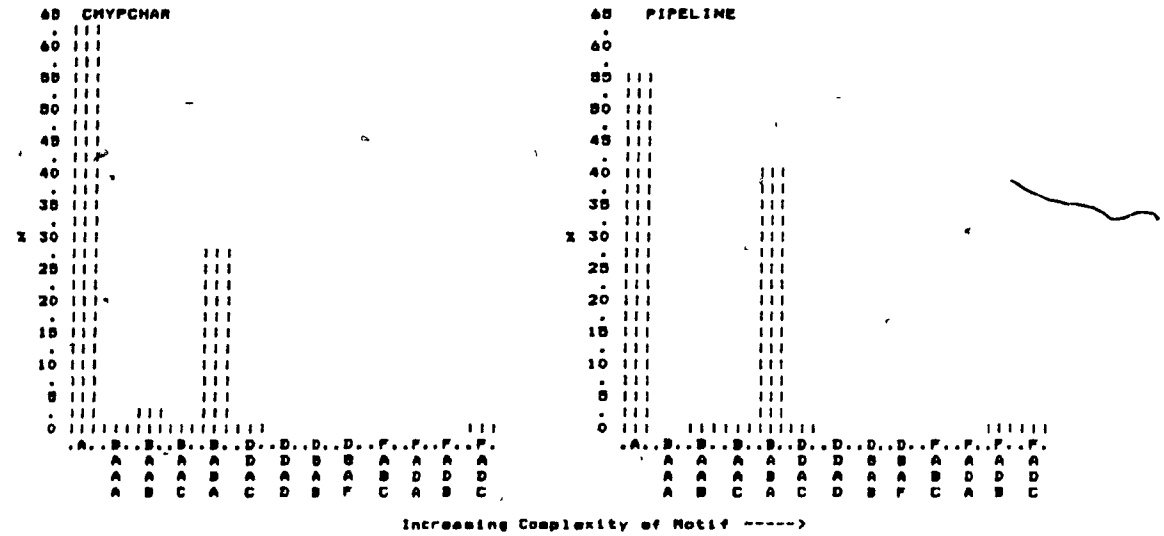


Figure 29: Histograms of Rim Section Attributes
(cont.) Neck Motif (Format 2)



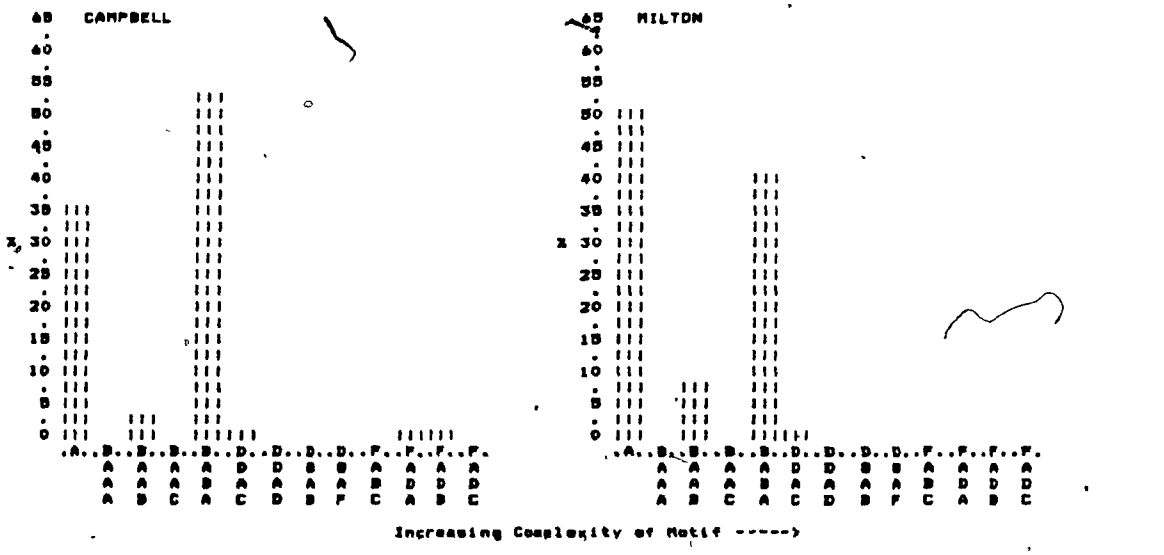
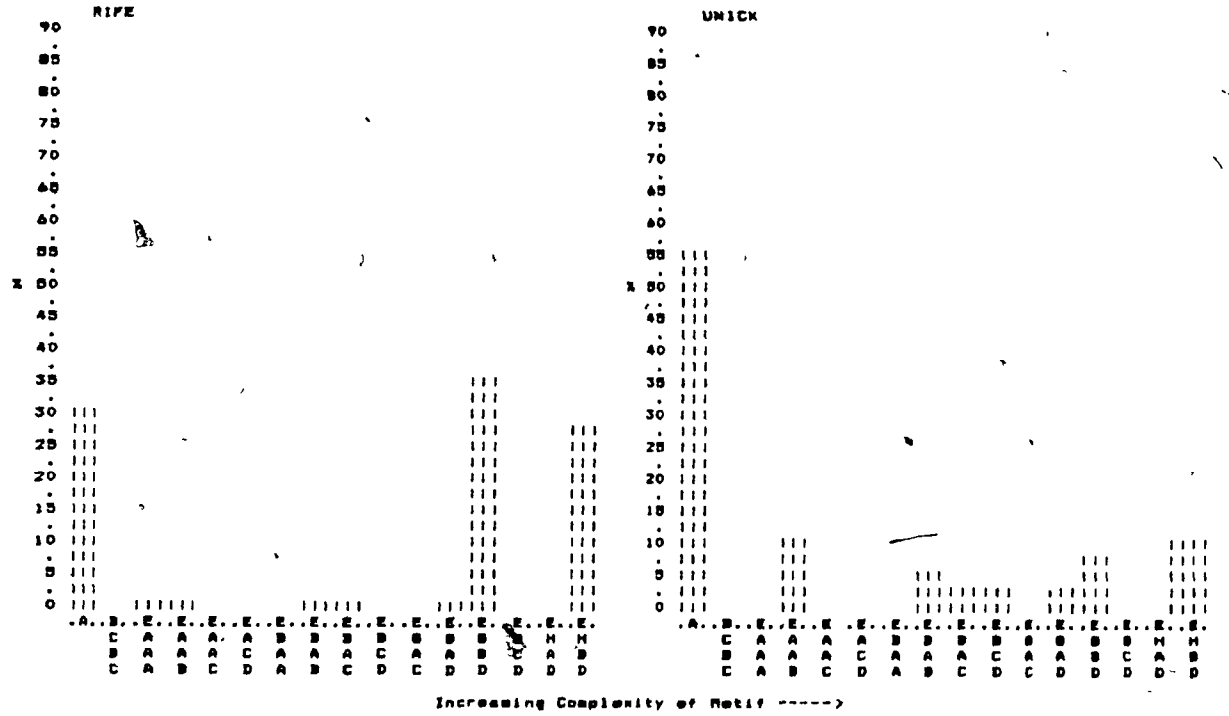


Figure 30: Histograms of Rim Section Attributes
Secondary Neck Decoration (Format 2)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% 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
A B E E E

Figure 30: Histograms of Rim Section Attributes
(cont.) Secondary Neck Decoration (Format 2)

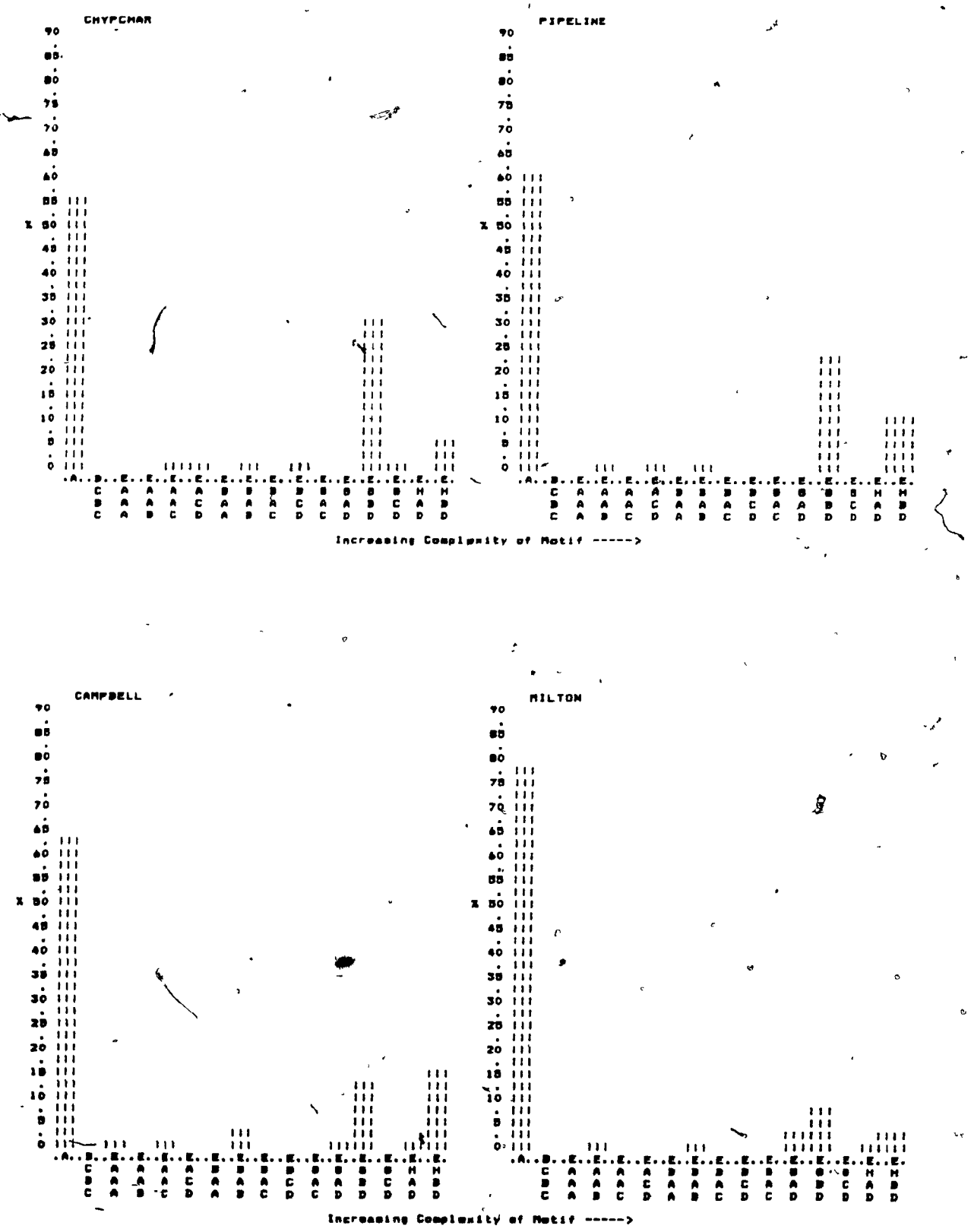


Figure 31: Histograms of Rim Section Attributes
Interior Rim Motif (Format 3)

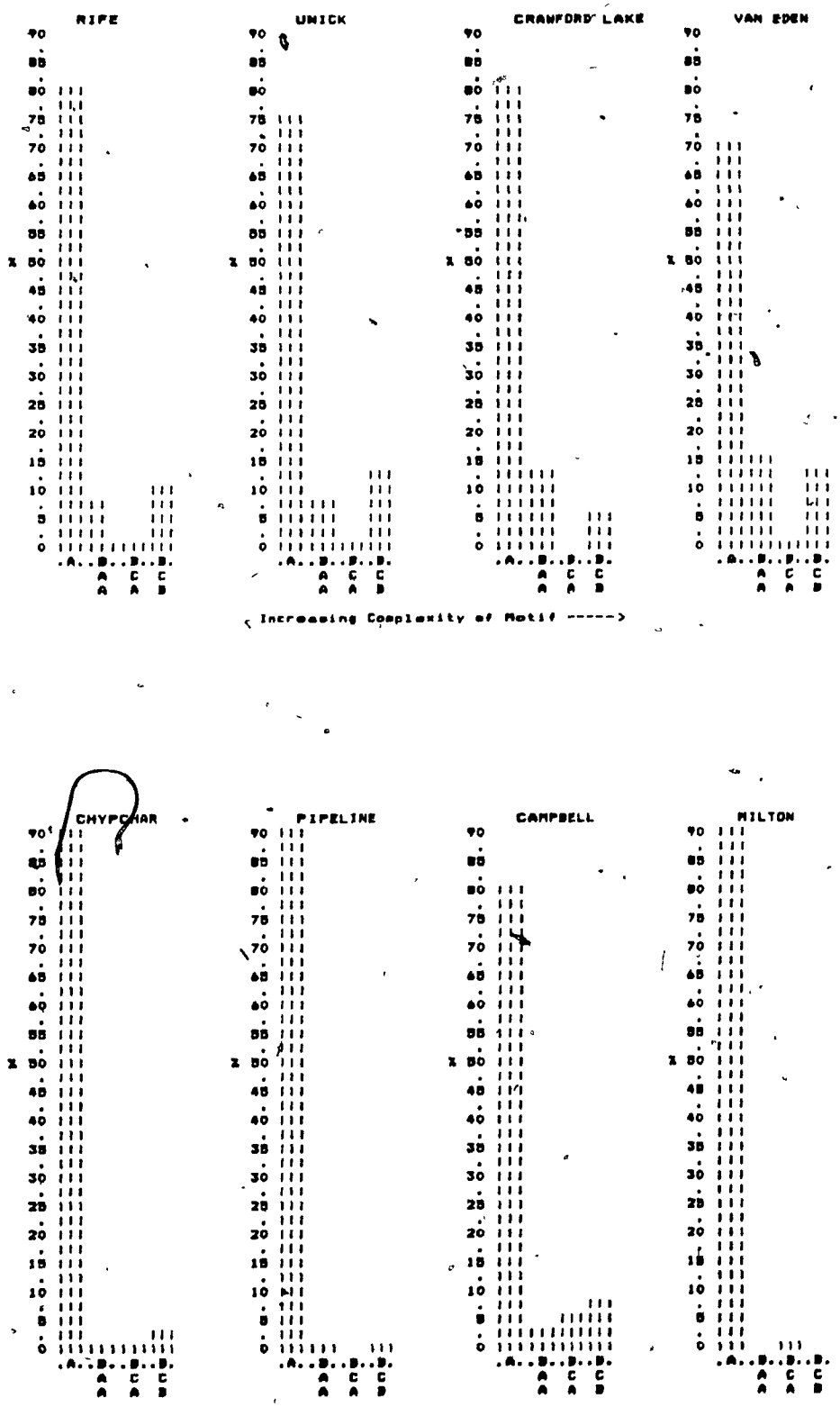


Figure 32. Histograms of Rim Section Attributes
Lip Motif (Format 3)

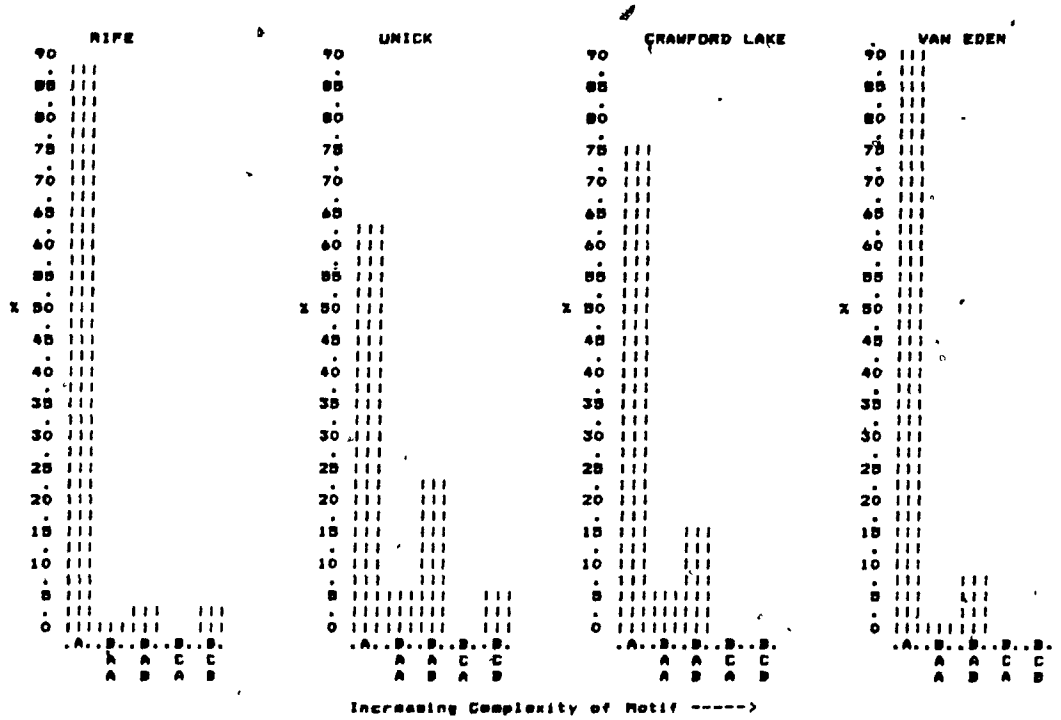


Figure 33: Histograms of Rim Section Attributes
Upper Rim Motif (Format 3)

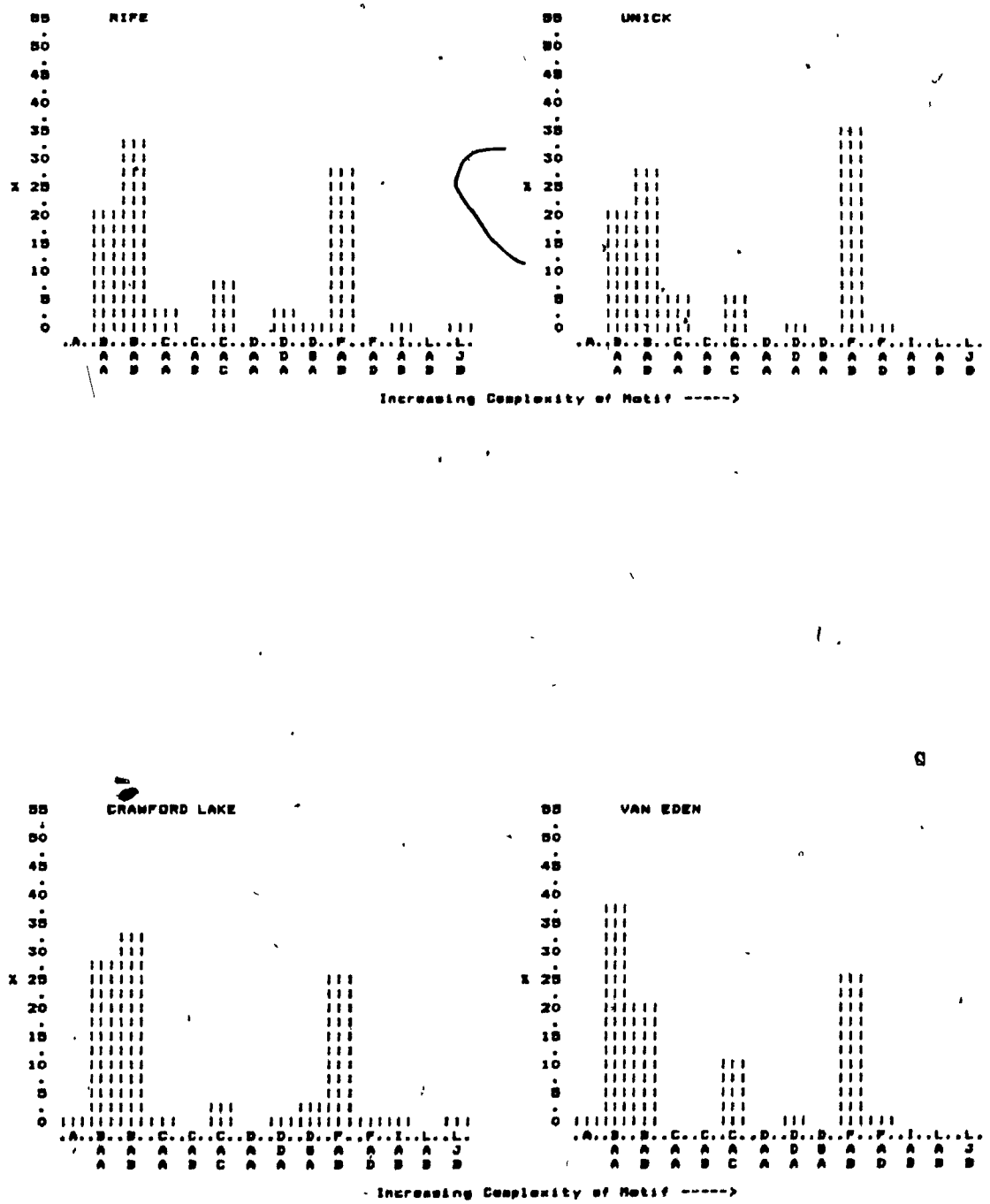


Figure 33: Histograms of Rim Section Attributes
(cont.) Upper Rim Motif (Format 3)

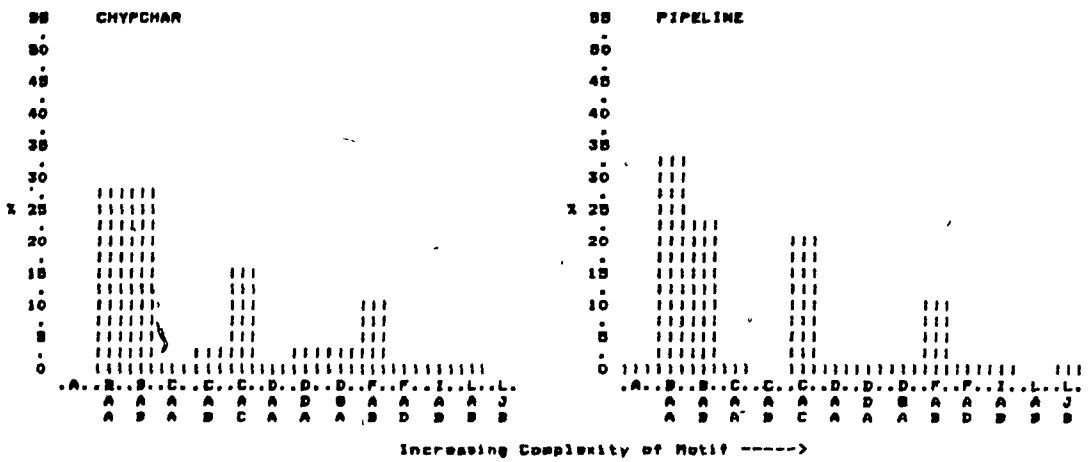


Figure 34: Histograms of Rim Section Attributes
Secondary Rim Decoration (Format 3)

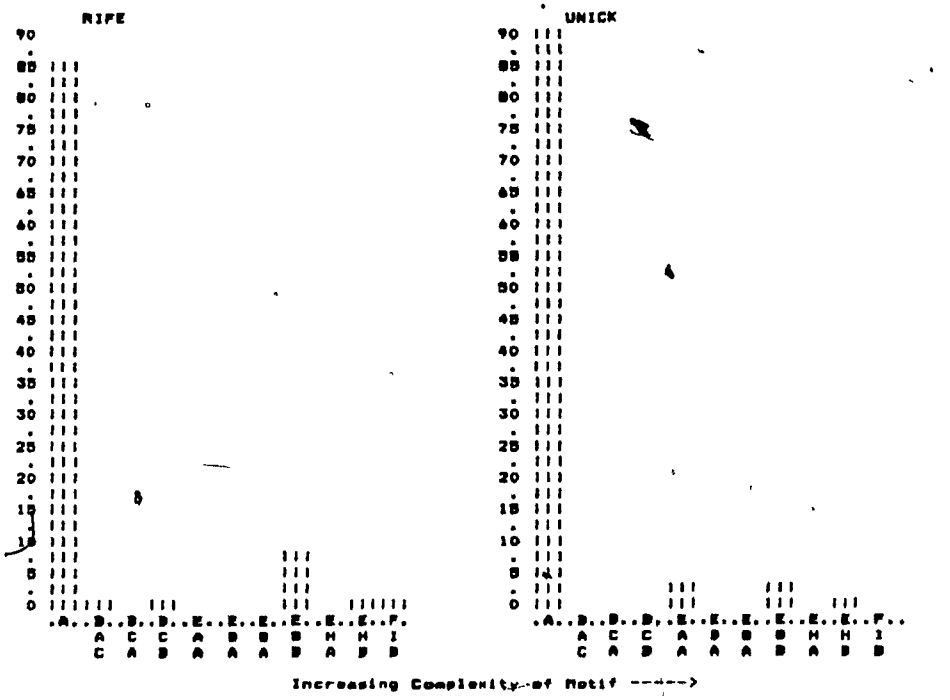


Figure 34: Histograms of Rim Section Attributes
(cont.) Secondary Rim Decoration (Format 3)

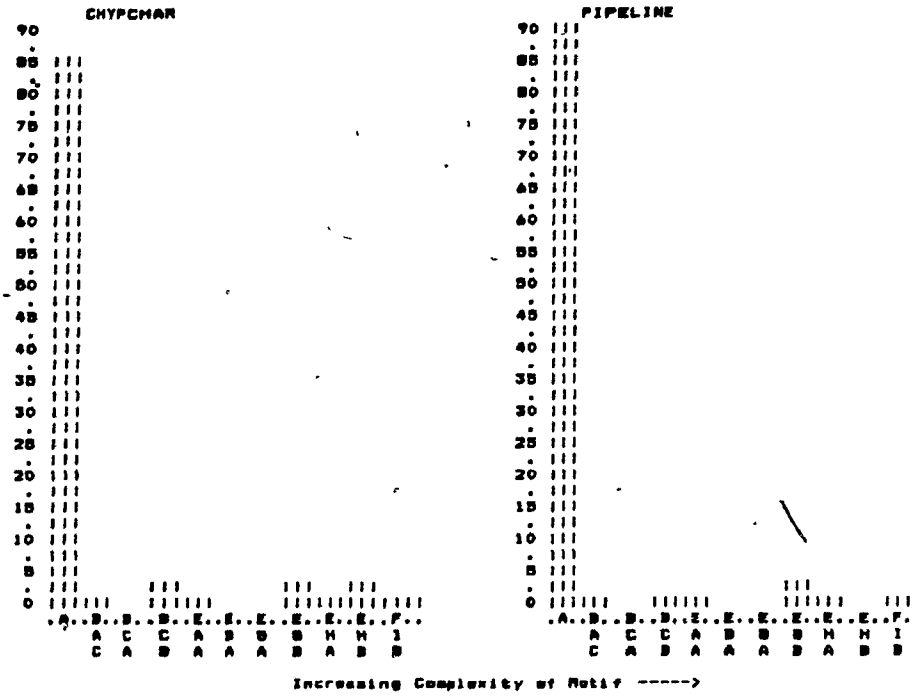


Figure 35: Histograms of Rim Section Attributes
Neck Motif (Format 3)

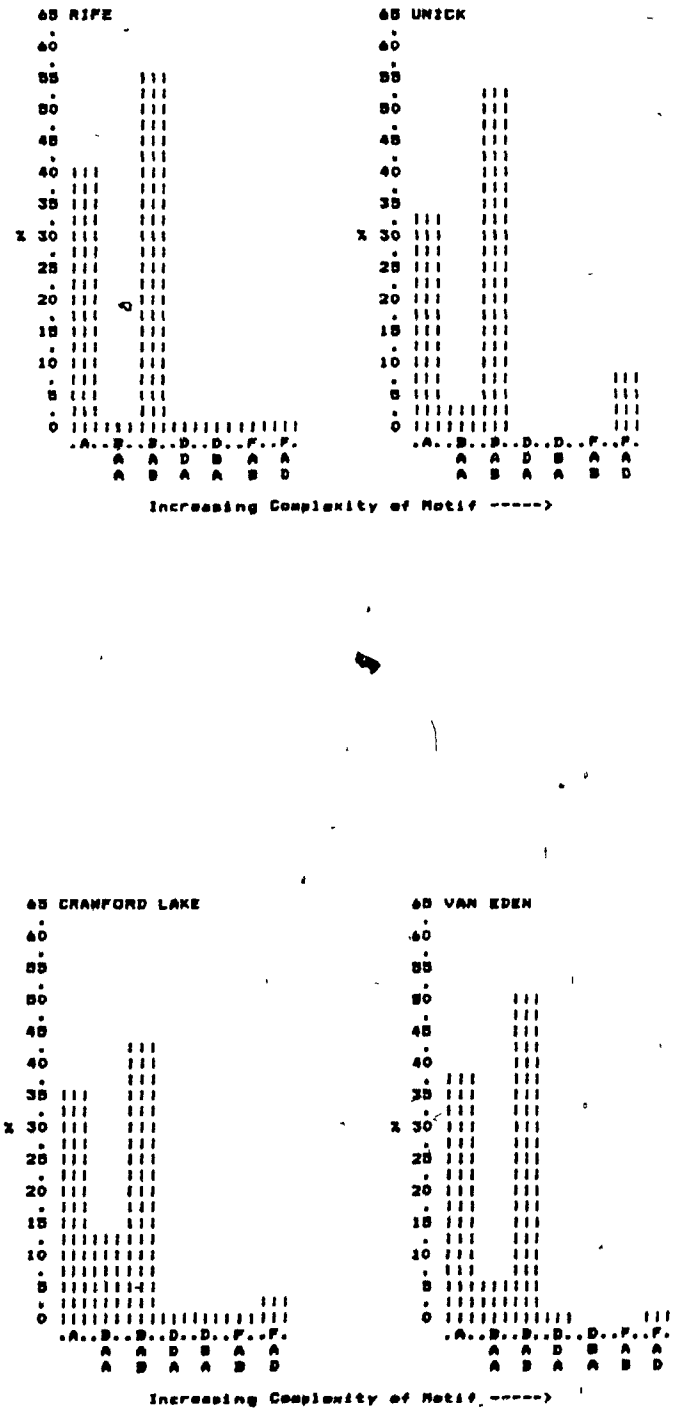


Figure 35: Histograms of Rim Section Attributes
(cont.) Neck Motif (Format 3)

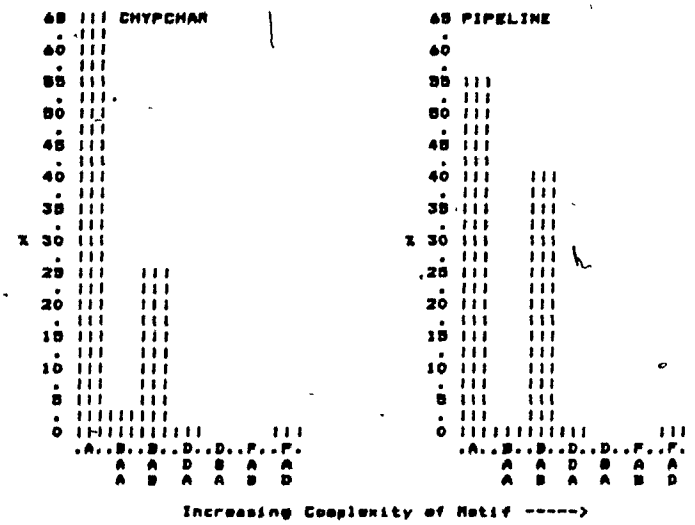


Figure 36: Histograms of Rim Section Attributes
Secondary Neck Decoration (Format 3)

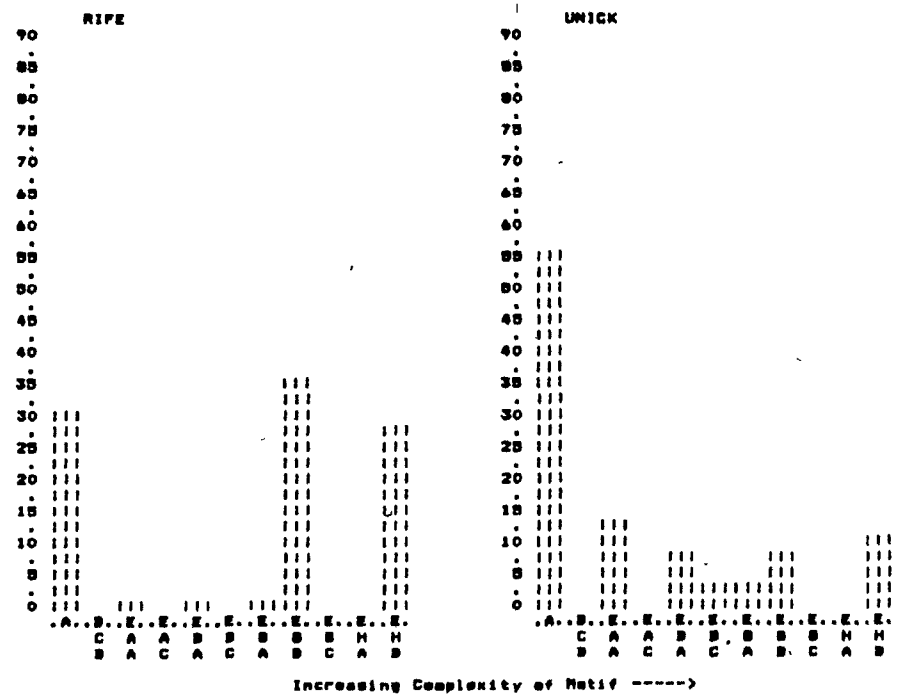


Figure 36: Histograms of Rim Section Attributes
(cont.) Secondary Neck Decoration (Format 3)

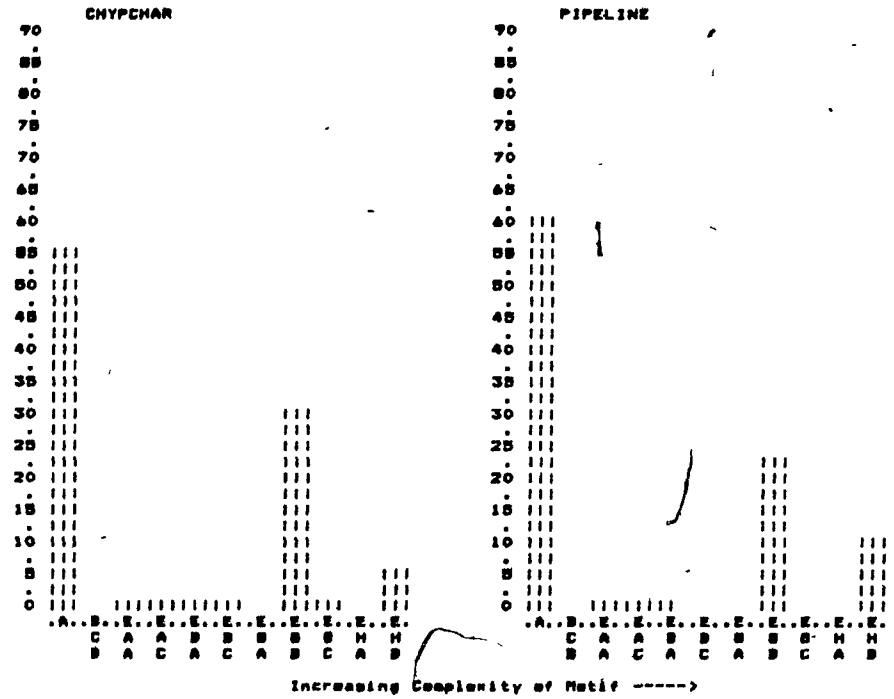
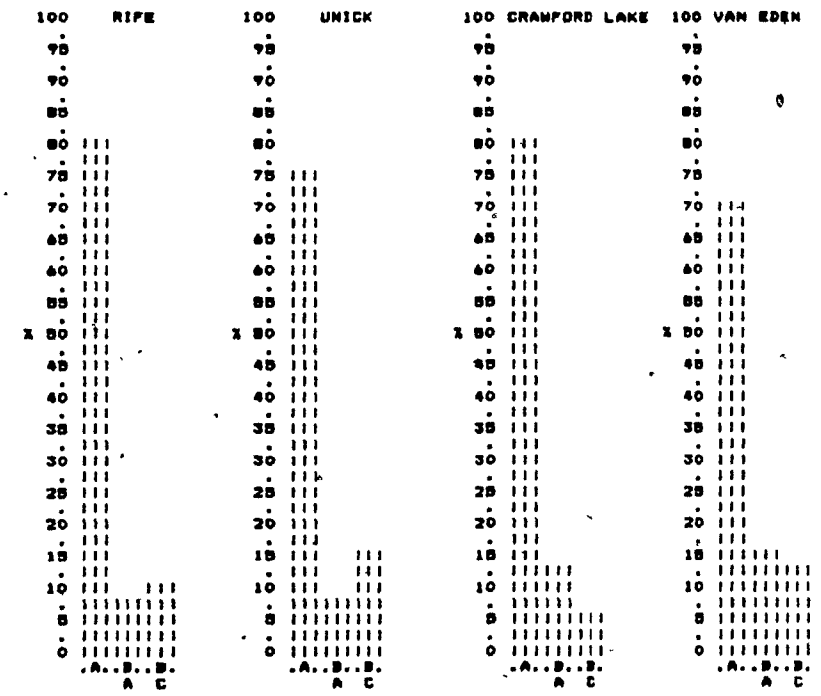


Figure 37: Histograms of Rim Section Attributes
Interior Rim Motif (Format 4)



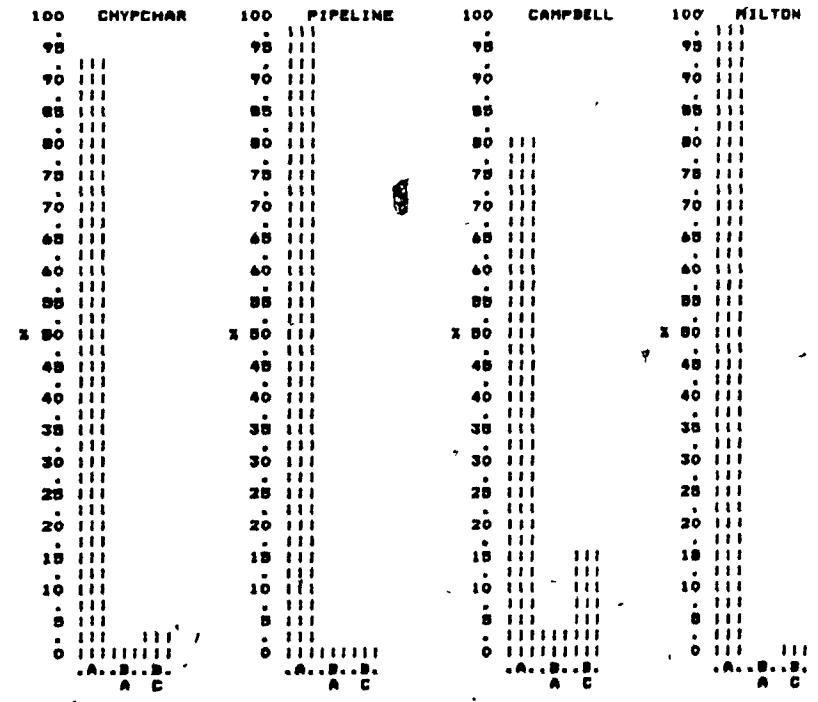


Figure 38: Histograms of Rim Section Attributes
Lip Motif (Format 4)

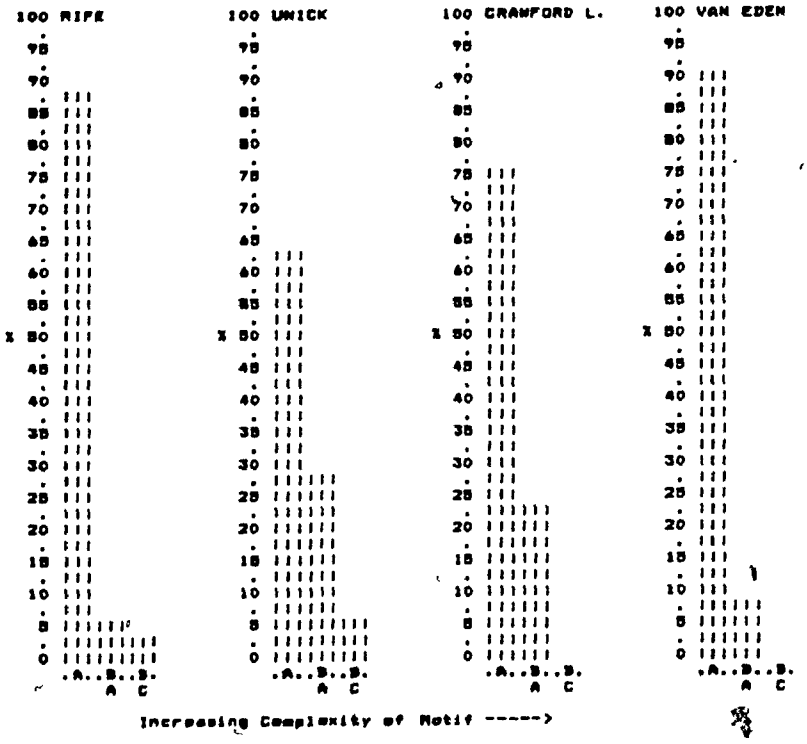


Figure 39: Histograms of Rim Section Attributes
Upper Rim Motif (Format 4)

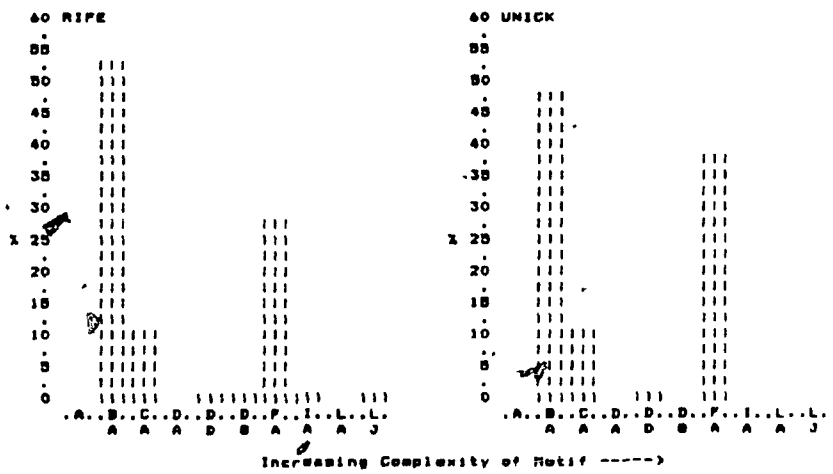


Figure 89: Histograms of Rim Section Attributes for Chypchar Site
(cont.) Upper Rim Motif (Format 4)

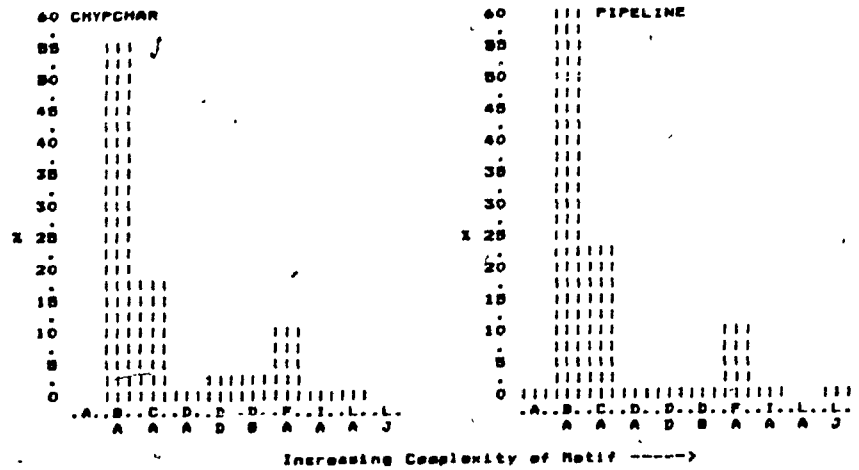
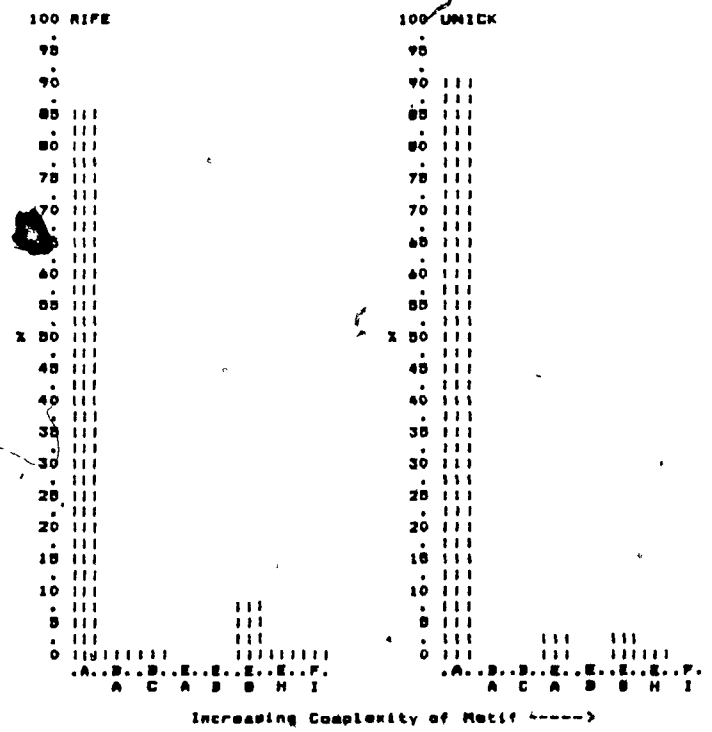


Figure 40: Histograms of Rim Section Attributes
Secondary Rim Decoration (Format 4)



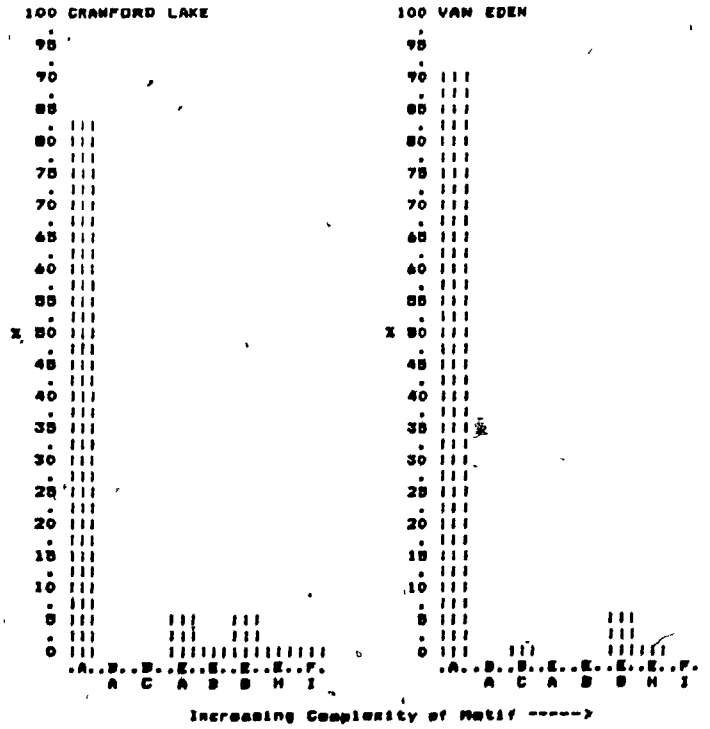


Figure 40: Histograms of Rim Section Attributes
(cont.) Secondary Rim Decoration (Format 4)

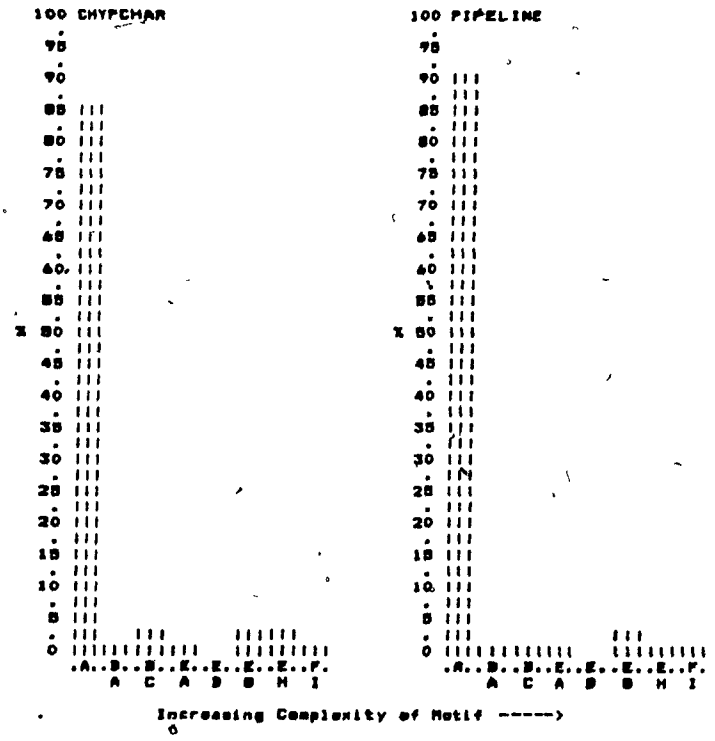


Figure 41: Histograms of Rim Section Attributes
Neck Motif (Format 4)

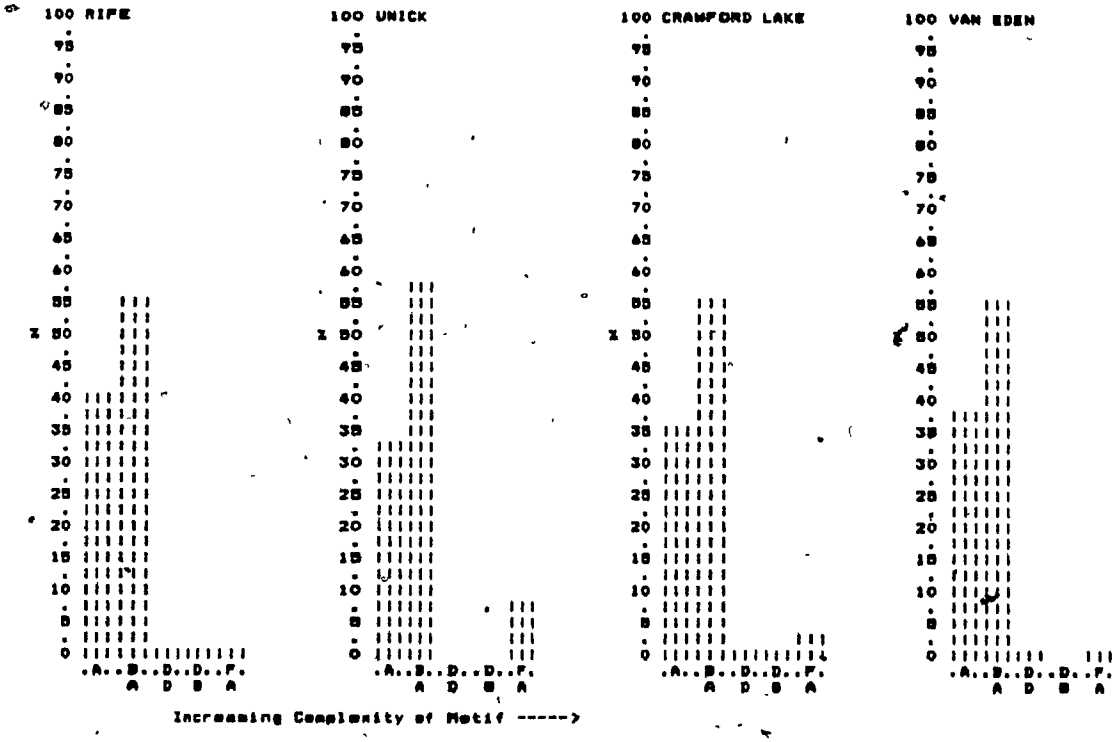


Figure 42: Histograms of Rim Section Attributes
Secondary Neck Decoration (Format 4) *

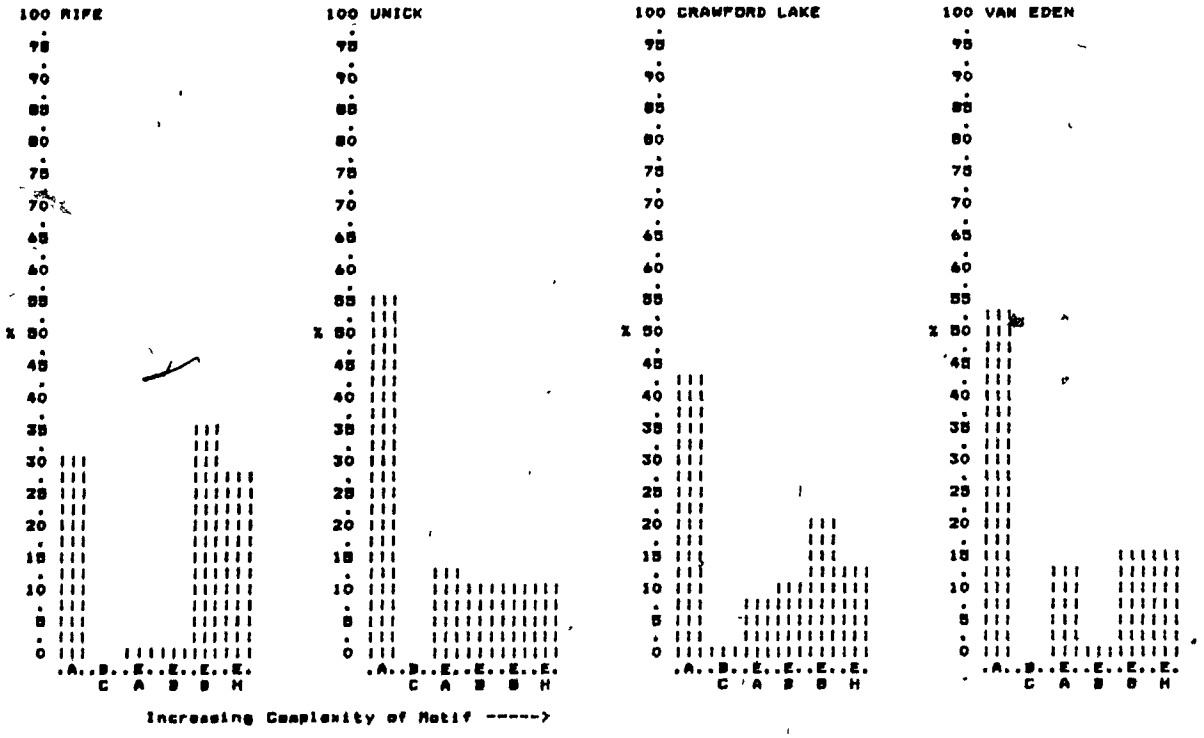


Figure 43: Histograms of Rim Section Attributes
Interior Rim Motif (Format 5)

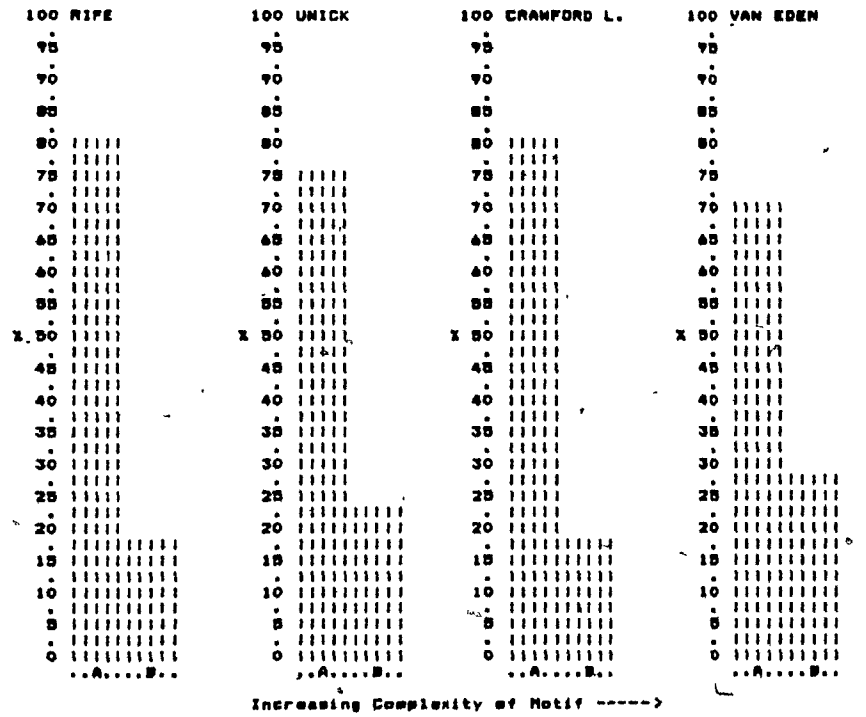


Figure 44: Histograms of Rim Section Attributes
Lip Motif (Format 5)

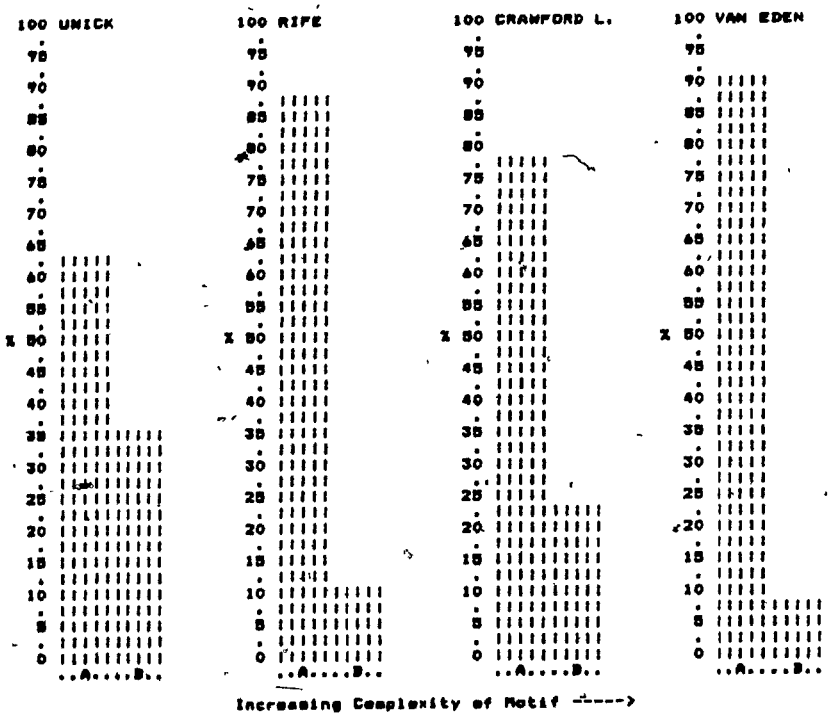


Figure 45: Histograms of Rim Section Attributes
Upper Rim Motif (Format 5)

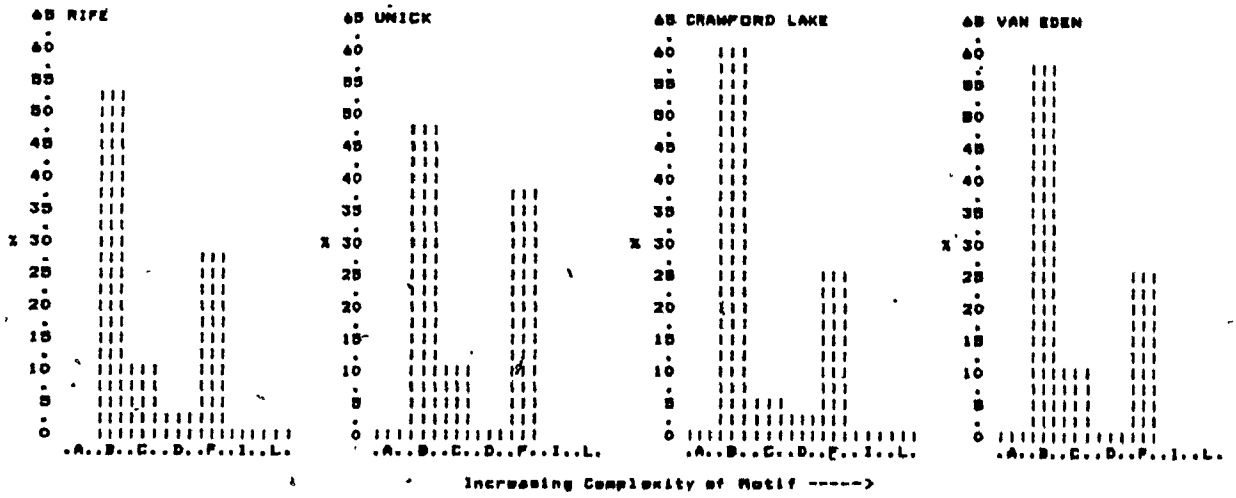


Figure 46: Histograms of Rim Section Attributes
Secondary Rim Decoration (Format 5)

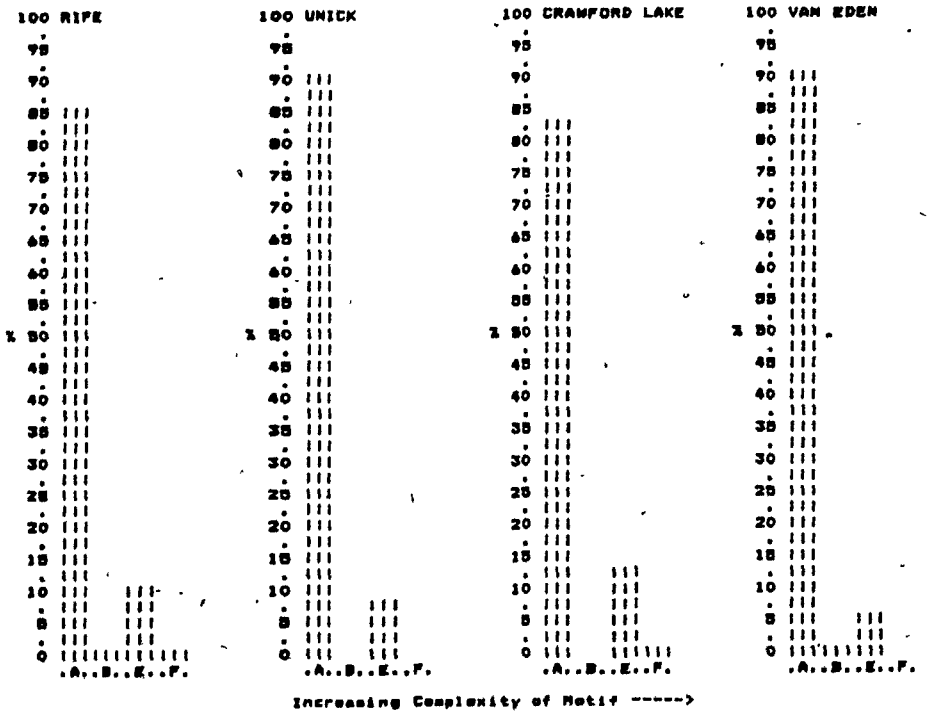
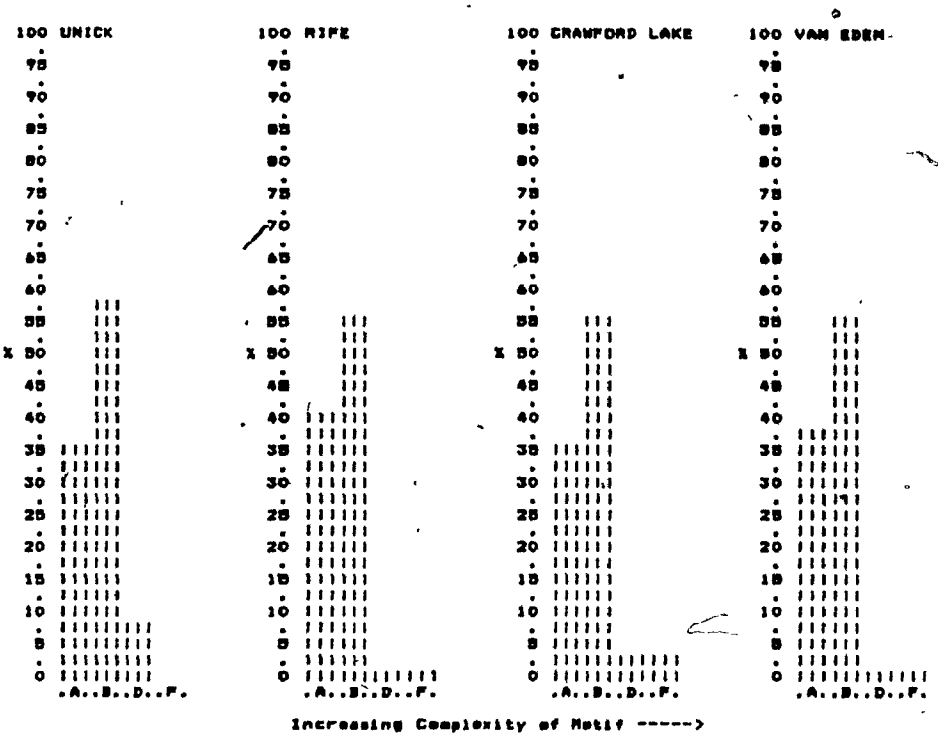


Figure 47: Histograms of Rim Section Attributes
Neck Motif (Format 5)



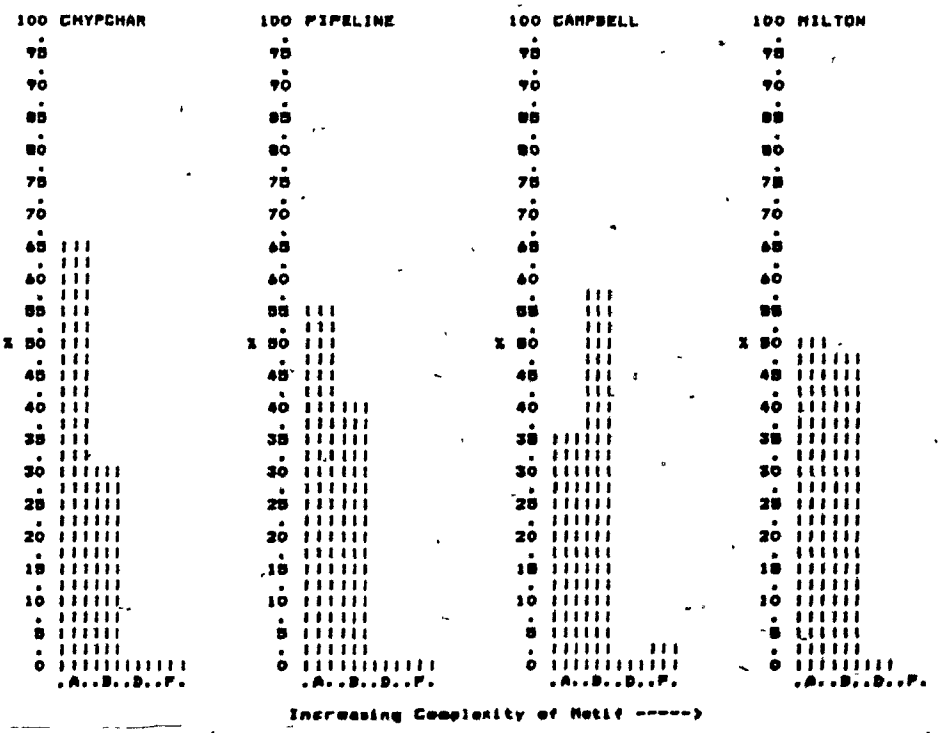


Figure 48: Histograms of Rim Section Attributes
Secondary Neck Decoration (Format 5)

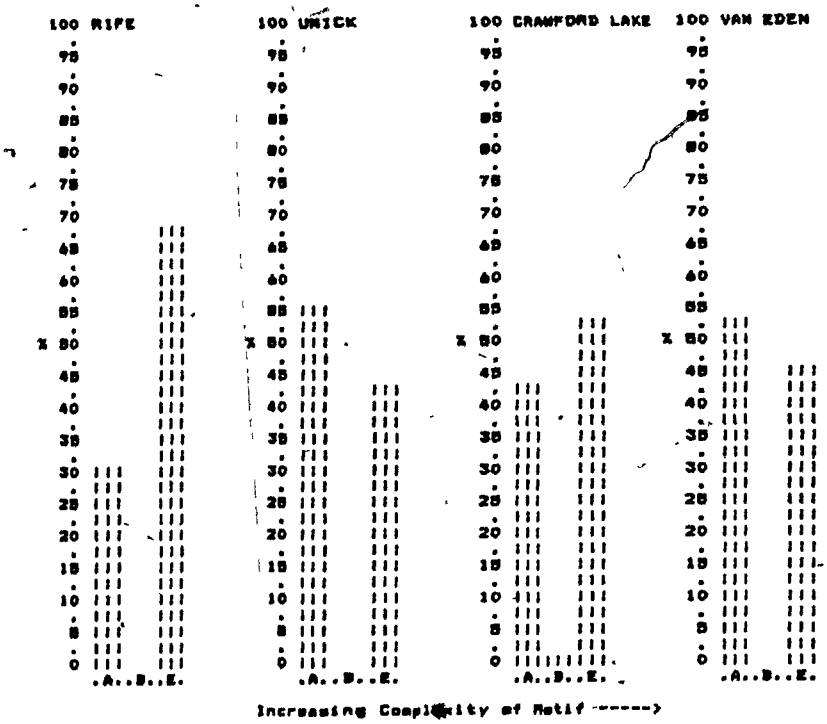
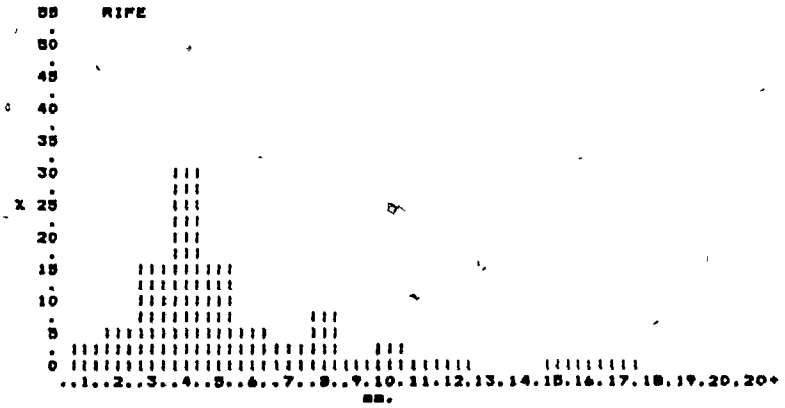


Figure 49: Histograms of Bowl Section Attributes
Pipe Lip Thickness (Format 1)



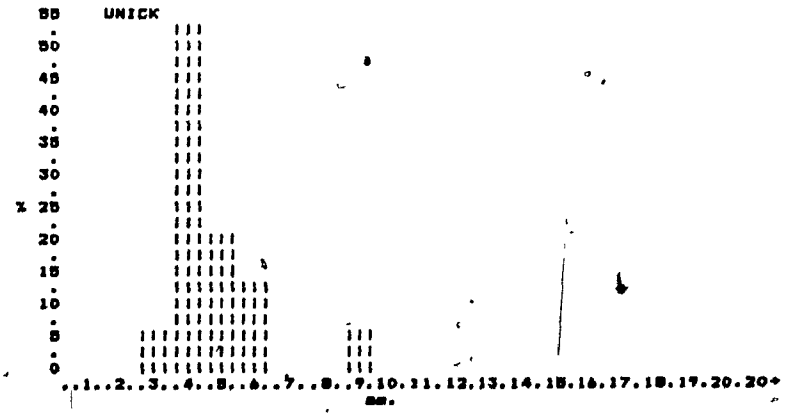
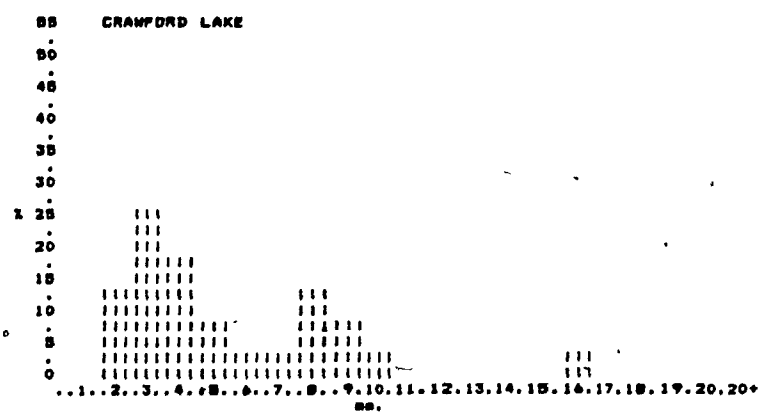


Figure 49: Histograms of Bowl Section Attributes
(cont.) Pipe Lip Thickness (Format 1)



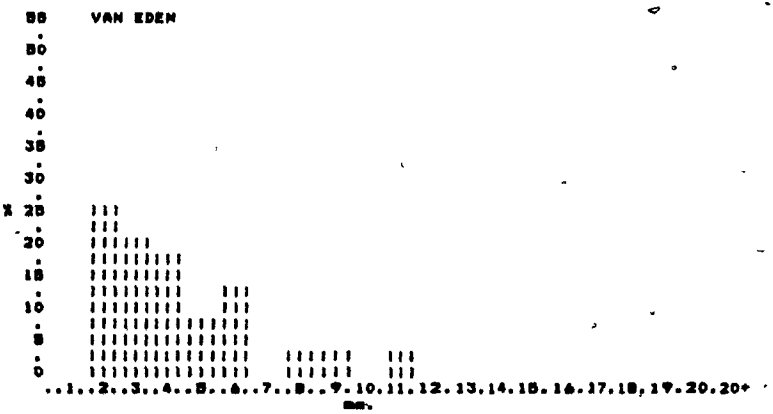
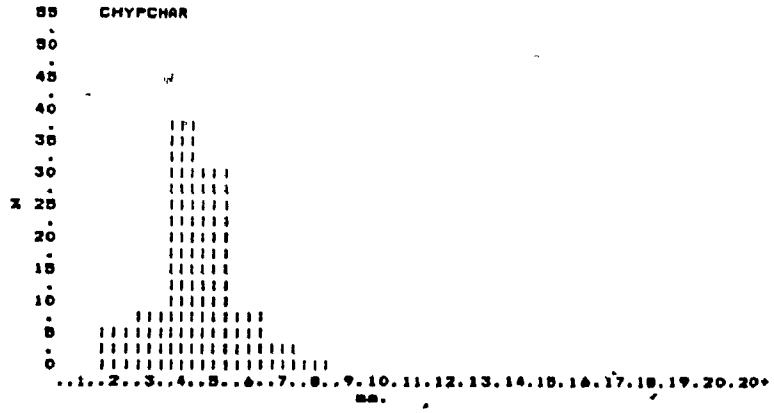


Figure 49: Histograms of Bowl Section Attributes
(cont.) Pipe Lip Thickness (Format 1)



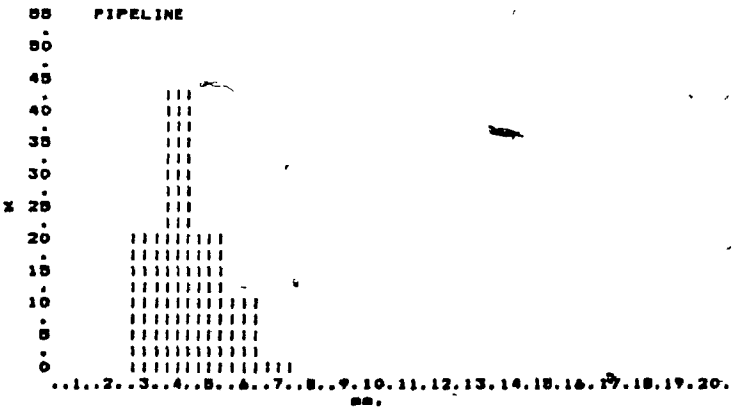
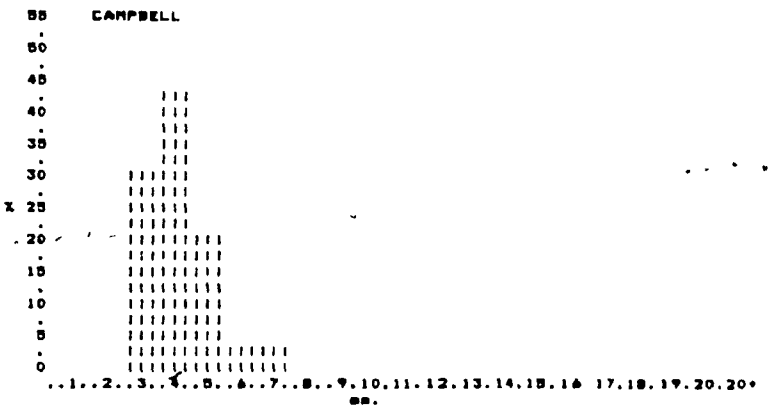


Figure 49: Histograms of Bowl Section Attributes
(cont.) Pipe Lip Thickness (Format 1)



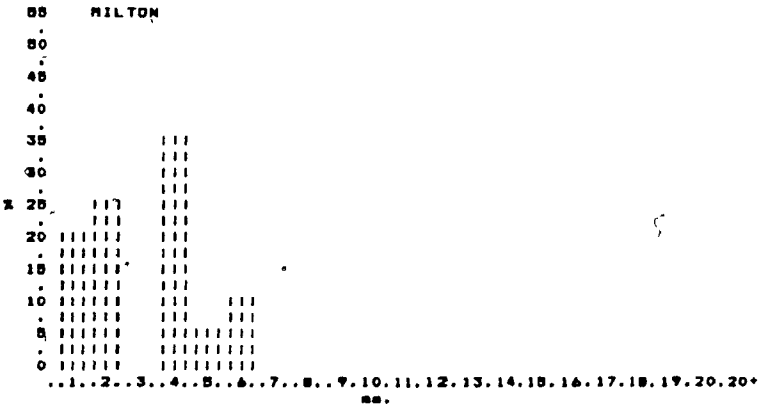


Figure 50: Histograms of Bowl Section Attributes
Bowl Motif (Format 2)

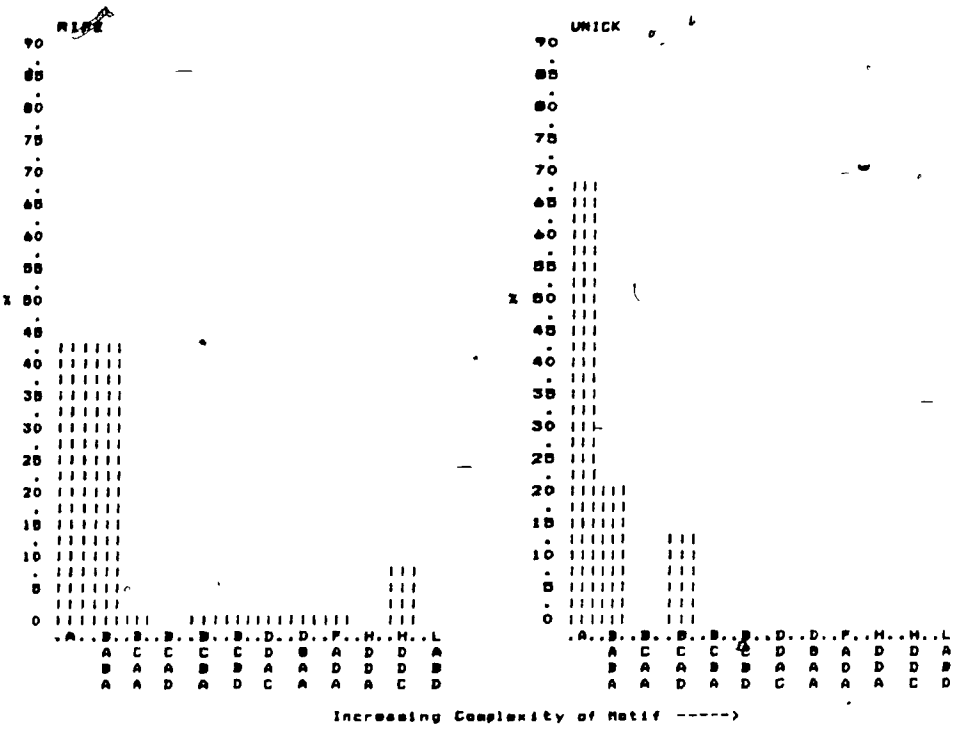


Figure 50: Histograms of Bowl Section Attributes
(cont.) Bowl Motif (Format 2)

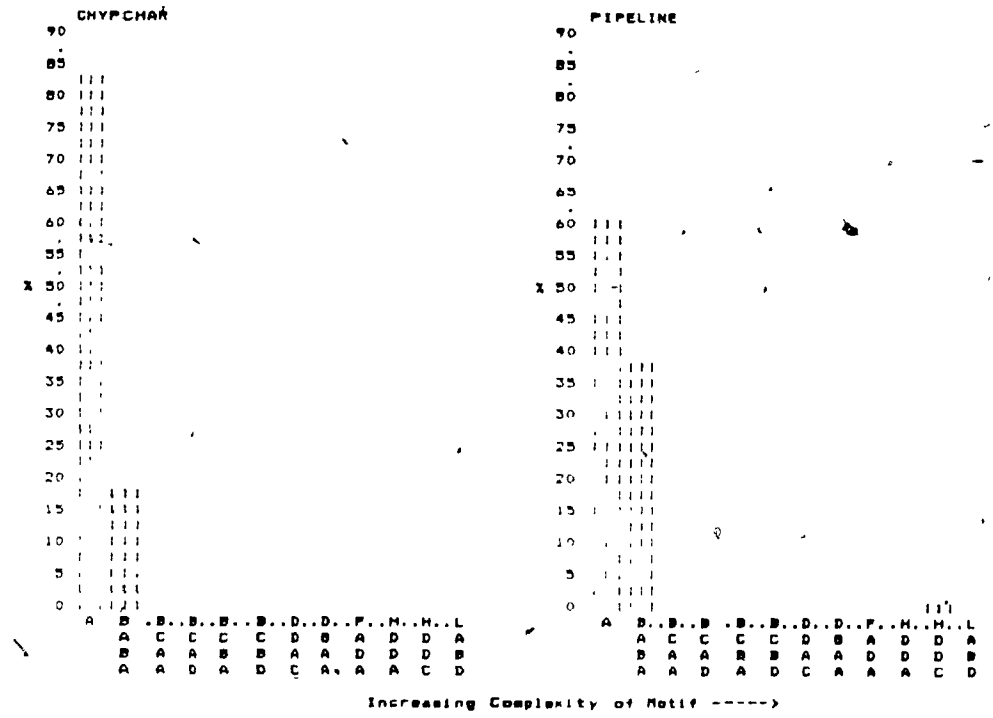


Figure 51: Histograms of Bowl Section Attributes Group 1 Sites
Secondary Bowl Decoration (Format 2)

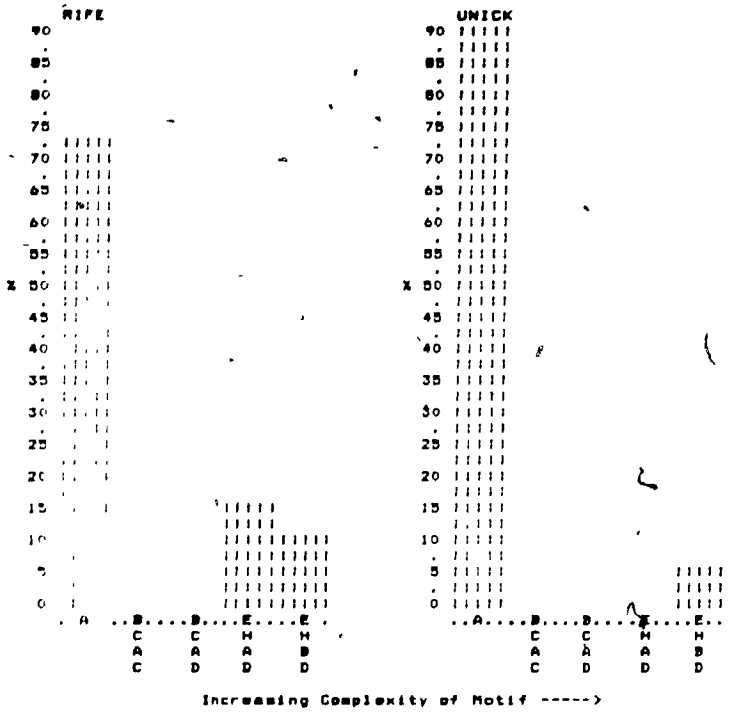
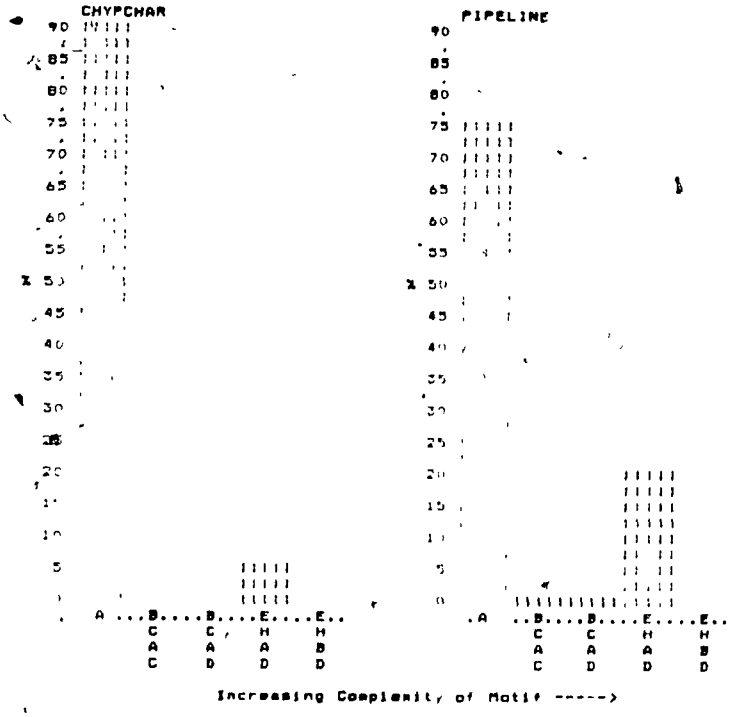


Figure 51: Histograms of Bowl Section Attributes
(cont.) Secondary Bowl Decoration (Format 2)



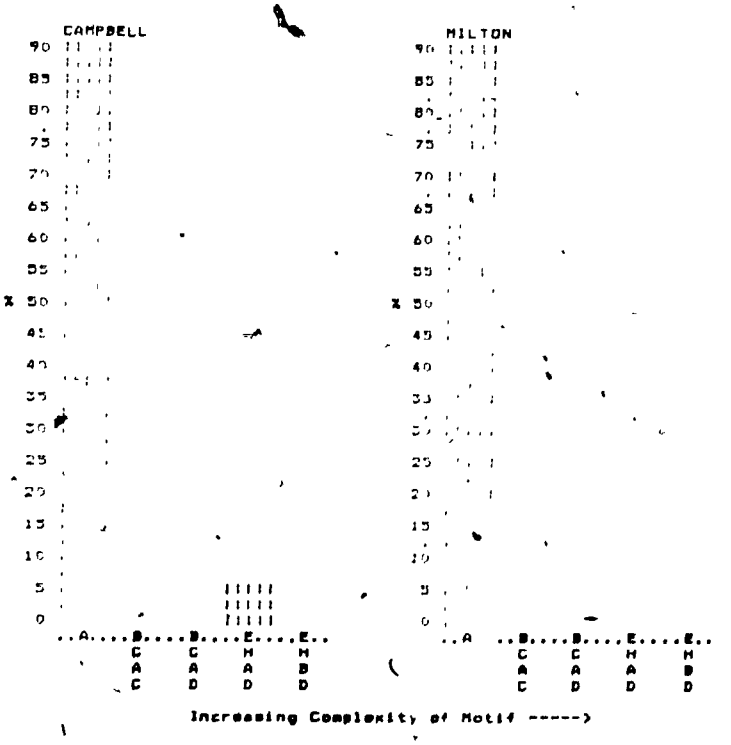


Figure 52: Histograms of Bowl Section Attributes
Bowl Motif (Format 3)

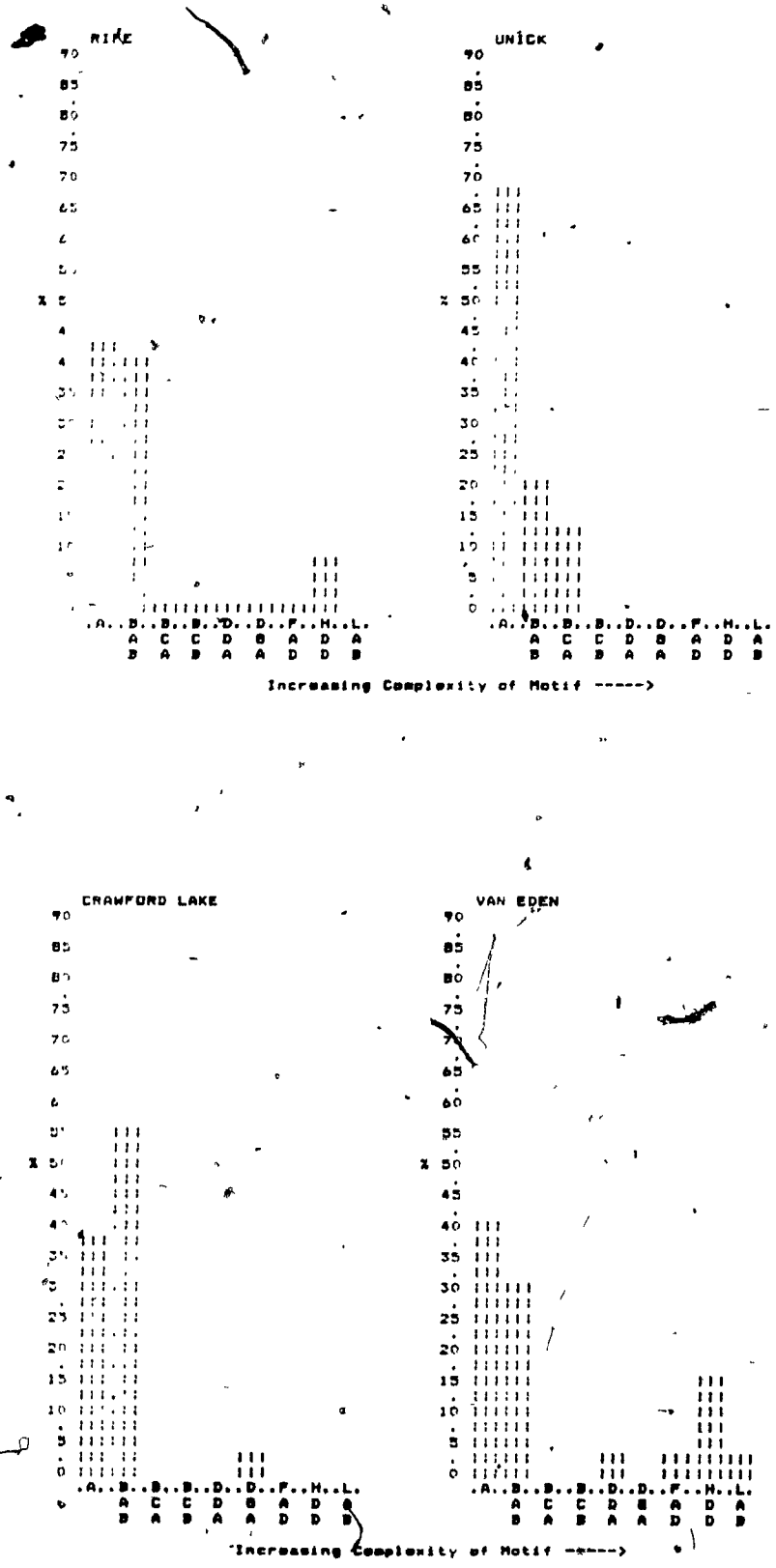
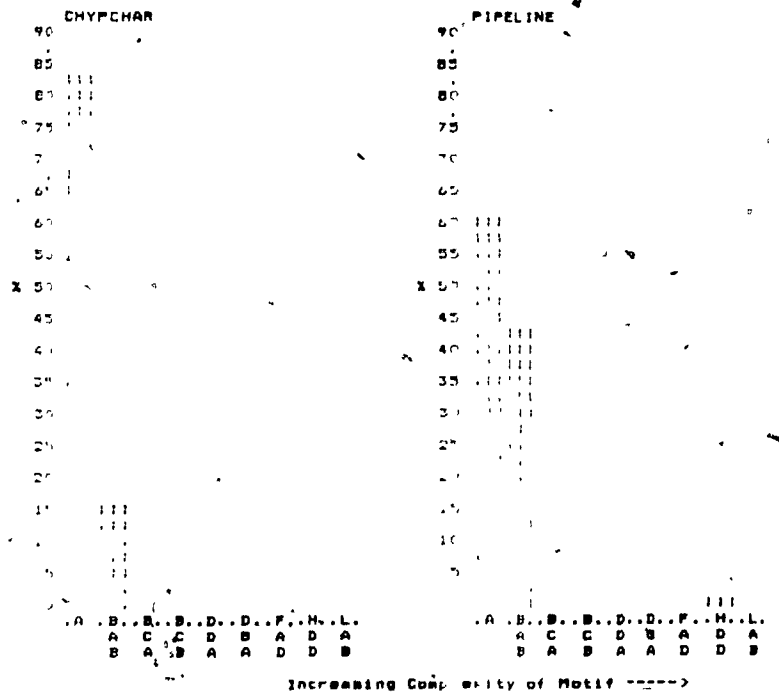


Figure 52: Histograms of Bowl Section Attributes
(cont.) Bowl Motif (Format 3)



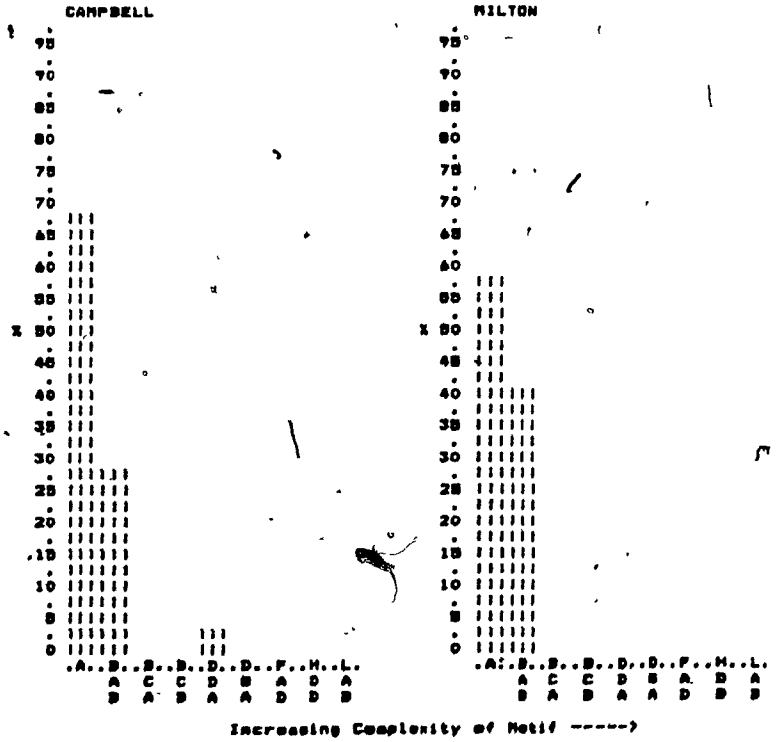


Figure 53: Histograms of Bowl Section Attributes
Secondary Bowl Decoration (Format 3)

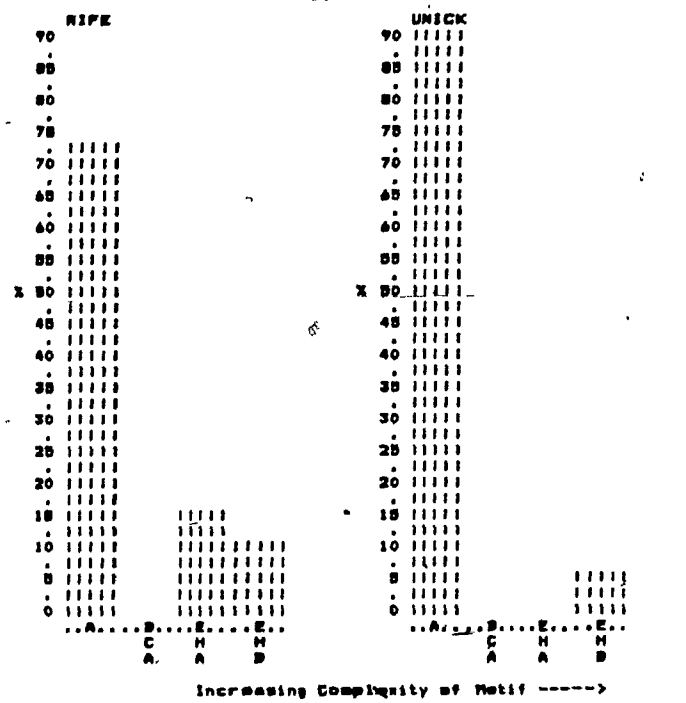
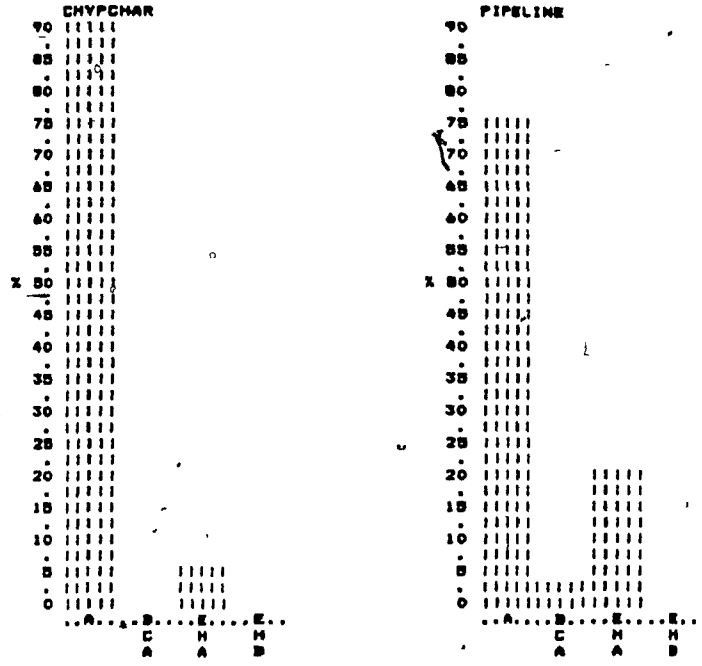


Figure 53: Histograms of Bowl Section Attributes
(cont.) Secondary Bowl Decoration (Format 3)



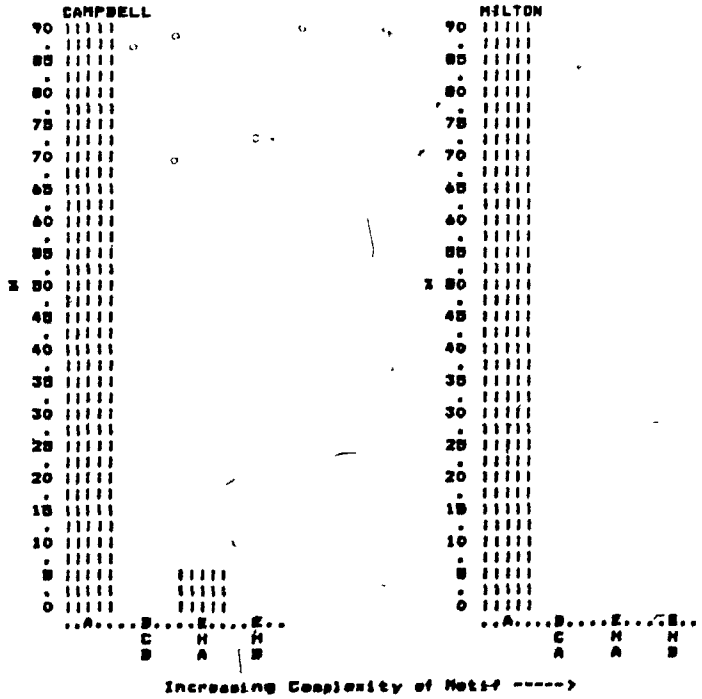


Figure 54: Histograms of Bowl Section Attributes
Bowl Motif (Format 4)

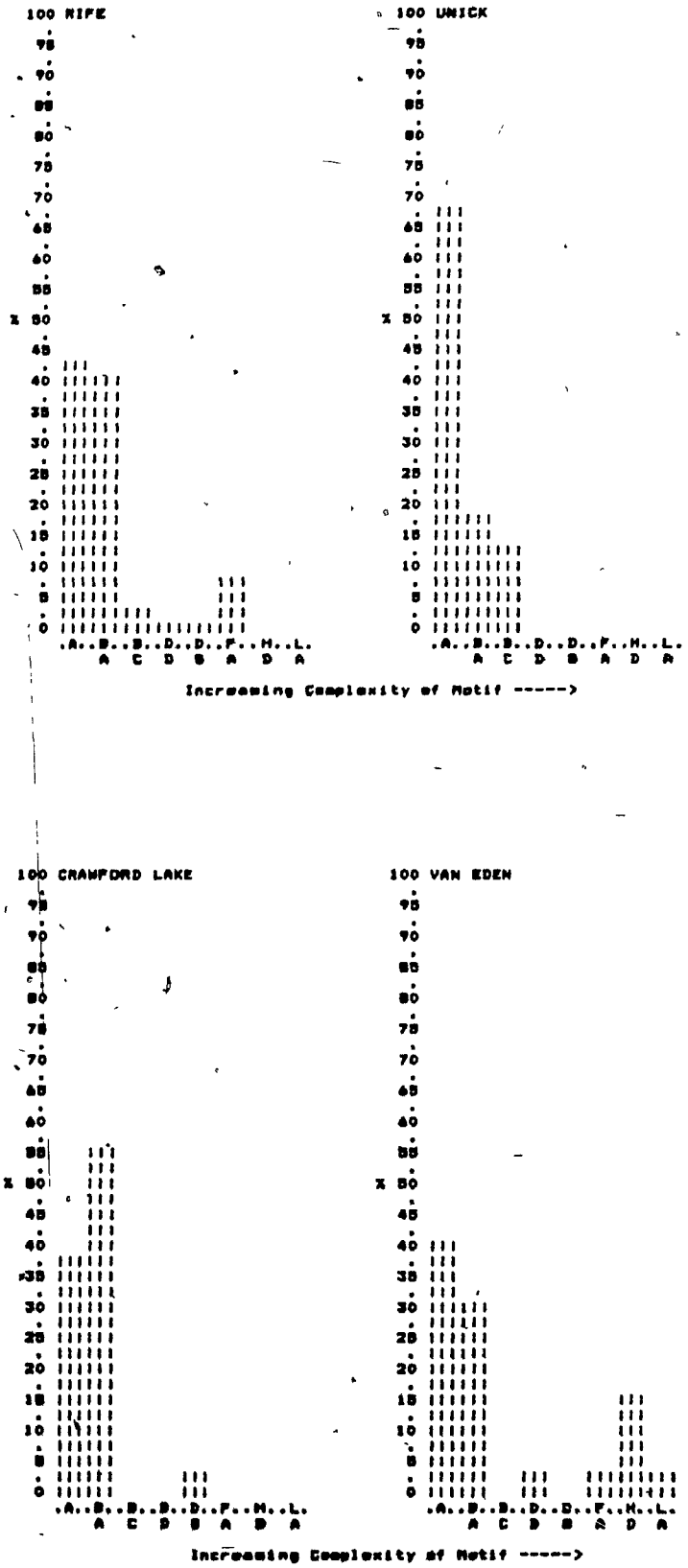

100 NIFE
100 UNICK
100 CRAWFORD LAKE
100 VAN EDEN
% 50
.A..B..B..D..D..F..M..L.
A C D B A D A
Increasing Complexity of Motif ----->

Figure 54: Histograms of Bowl Section Attributes
(cont.) Bowl Motif (Format 4)

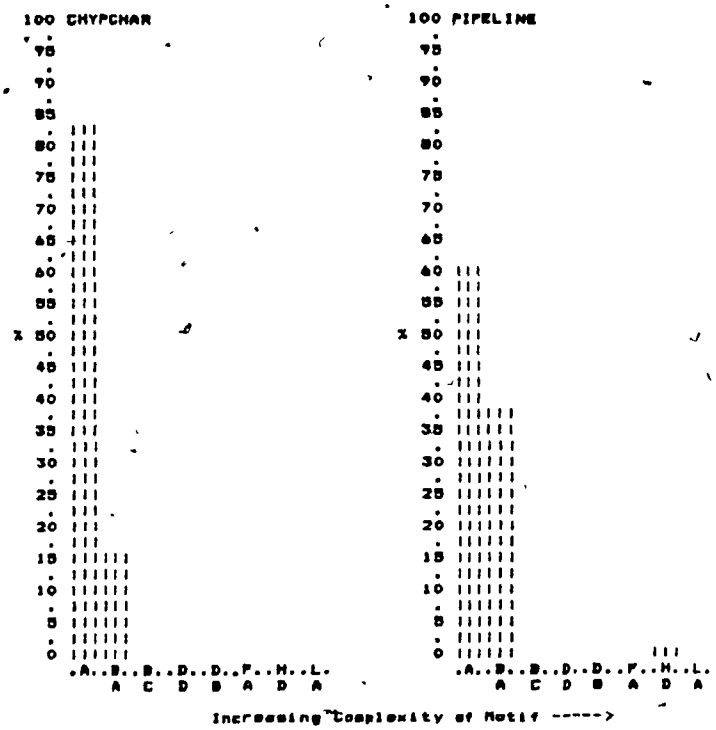


Figure 55: Histograms of Bowl Section Attributes
Secondary Bowl Decoration (Format 4)

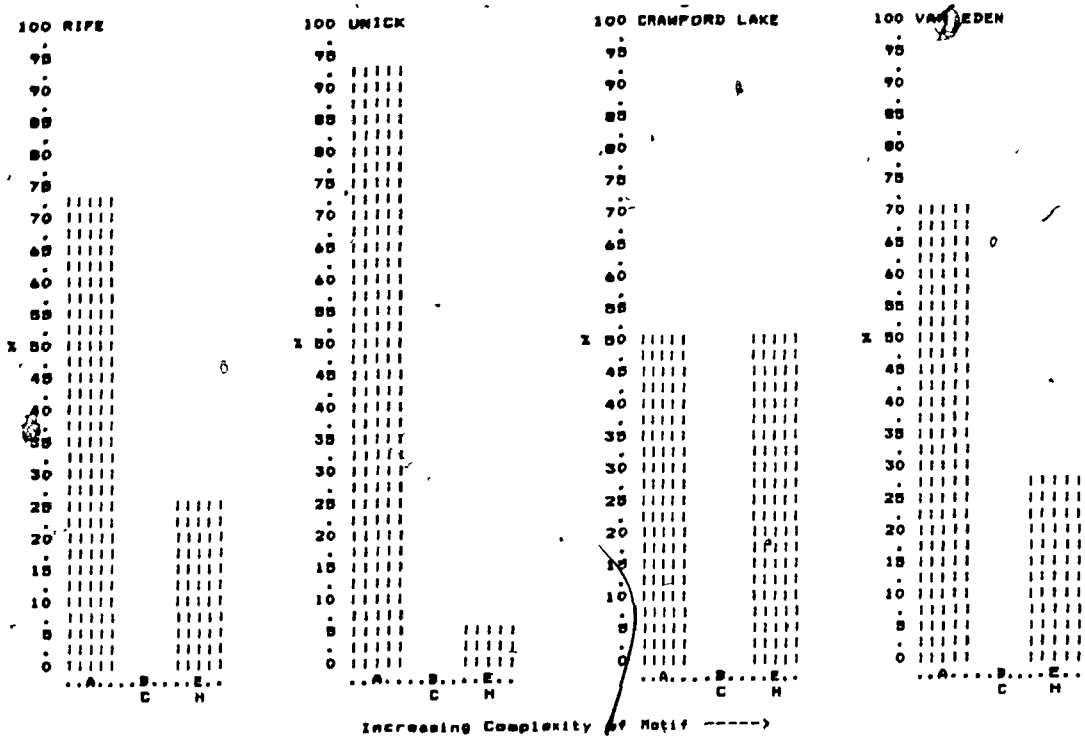


Figure 56: Histograms of Bowl Section Attributes
Bowl Motif (Format 5)

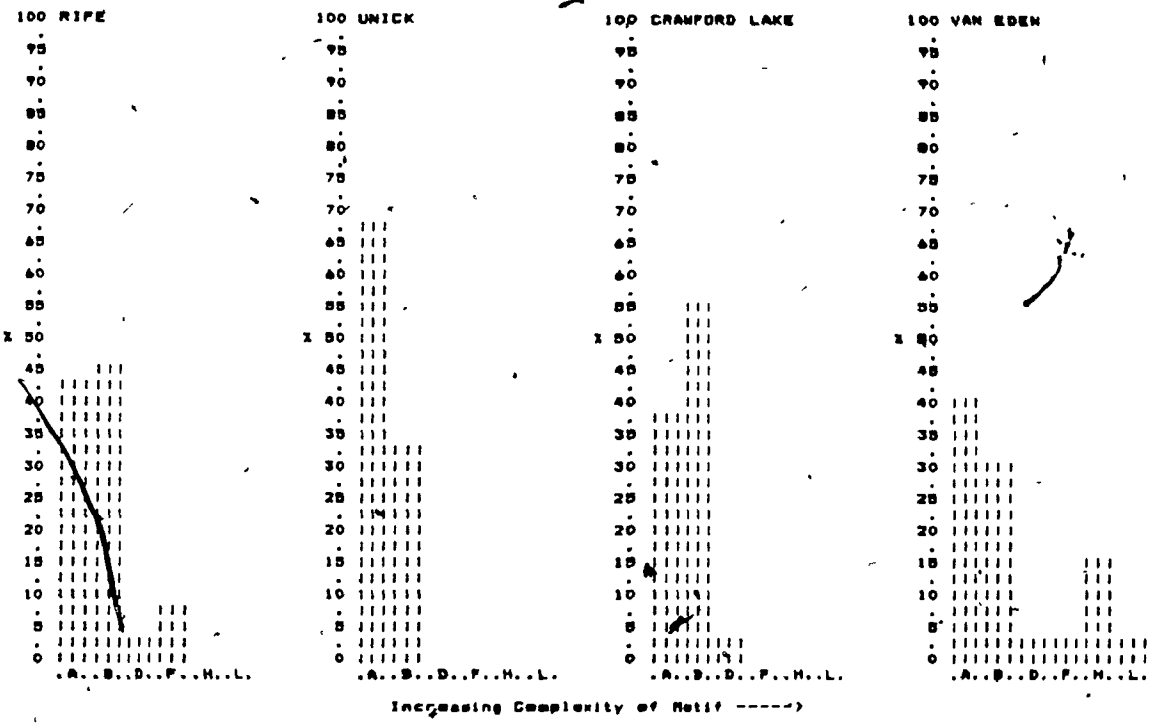
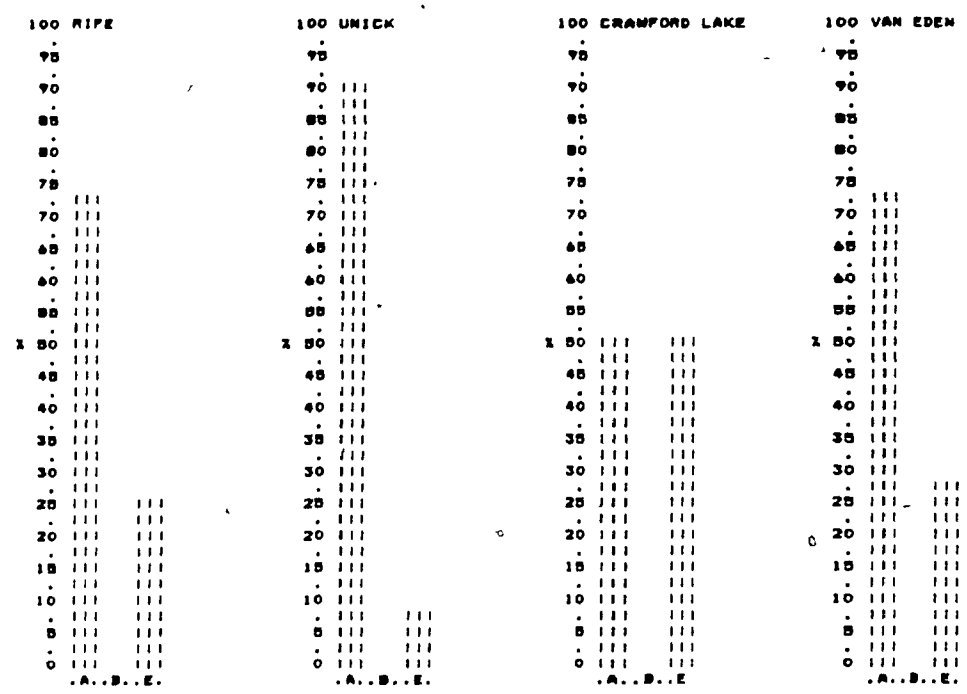


Figure 57: Histograms of Bowl Section Attributes
Secondary Bowl Decoration (Format 5)



The next step was to examine variation in the variables as a whole. A number of techniques, both visual and statistical, were employed. Statistical means of examining and identifying pattern of variation in a data base include both cluster and association analysis. Cluster analysis has been used most often by Iroquoian researchers for chronological seriation by applying statistical techniques that produce linear orders of sites, which are inferred to be temporally significant. The statistic most commonly used in such procedures is the Robinson-Brainerd coefficient of similarity, calculated by summing the differences in percentage of the values of a variable between two sites, and subtracting the sum from 200 (Robinson 1951; Brainerd 1951). The coefficients of similarity may then be used for linking techniques such as Double-link clustering (Renfrew and Sterud 1969). There is, however, nothing inherently temporal about measures of similarity or linking techniques, and the patterns produced may be employed for inference at levels other than that of time. One such application was Ramsden's (1977) attempt to discover ethnically related clusters of Iroquoian sites in the course of his dissertation research. He criticized the use of the Robinson-Brainerd coefficient of similarity on the grounds that:

> ... since this coefficient reduces all the ceramic categories on a pair of sites to a single number and since the frequency of different ceramic categories may reflect very different chronological, spatial and social factors, the resulting coefficient is of very ambiguous or dubious significance, unless the reason for similarity is already known (Ramsden 1977, 58).

In other words, Ramsden objected to this coefficient because it must be calculated using all the values of a variable. He chose to use what he called a measure of difference (Ramsden 1977, 58) calculated by summing the differences in percentages of only certain values or attributes (the ones that he considered key), thus ignoring the relationships among the

values of a variable, or between variables. Using this coefficient of difference, Ramsden applied Single-link cluster analysis (Hodson 1969) to produce a single dendrogram linking all of the sites in his sample (Ramsden 1977, 166). He then used this dendrogram as a tool for his interpretation of relationships among the sites he was examining.

A major problem is encountered in Ramsden's study when we consider the means by which he selected the specific key attributes used to calculate his measure of difference. Concerning this, he states that:

> Traits were selected for study on the basis of their suspected or observed variability through time and/or space in the context of Huron ceramic development. Some traits were known at the outset to be significant either chronologically or spatially on the basis of previously published analyses of Huron ceramics ...
>
> Some other traits were known or strongly suspected by me to be significant on the basis of a fairly long-term association with Huron ceramics ... (Ramsden 1977, 76-77).

Ramsden therefore selected the traits he considered spatially and temporally meaningful from external sources (previous analyses and personal intuition) before he examined his ceramic sample; the traits were not identified by an internal examination of the sample. Because of this there is the possibility that the means of selection and the patterns discovered are tautological in the same sense that Marian White's selection of attributes for her sites in the Niagara Frontier area of New York State may have been, as discussed in Chapter 2.0. In other words, the pattern that Ramsden investigated may be directly attributable to the traits selected because the pattern of other traits was not considered, and the traits he selected were examined out of context with respect to the variables that gave them meaning.

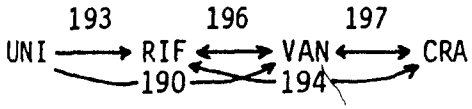
If we allow the methodological assumption stated above that

attribute variables are useful analytical entities, we can avoid some of the problems involved in selecting key attribute variation by employing a means of comparing variables to one another within the sample. One way of doing this is through cluster analysis, employing Single and Double-Link techniques and dendrograms, for all of the variables instead of for single isolated attributes. Since we use variables in this procedure, the Robinson-Brainerd coefficient of similarity can be used as a valid measure. Accordingly, tables of coefficients of similarity were calculated among all the sites in the present sample and for all of the variables under consideration. Using the Renfrew-Sterud Double-linking technique, these tables were arranged into ordered matrices of coefficients of similarity based on the similarities between pairs of sites (Renfrew and Sterud 1969), thereby providing linear orders (seriations) of the sites. These are presented in Tables 168 - 245. These one-dimensional linear orders were translated into two-dimensional visual displays of clustering using Single-link clustering to produce dendrograms. These dendrograms are presented in Figures 58 - 135.

As was noted in Chapter 4.0, the Double-link diagrams are included after each table of coefficients of similarity. To reiterate, the technique involves placing the sites with the highest coefficients next to each other in a linear order. For example, in Table 168 Pipeline and Milton are placed adjacent to each other because they have the highest coefficient of similarity (199.20) in the table. Crawford Lake and Van Eden are placed next to each other because they have the second highest coefficient (197.35), and so on. The links between sites are indicated in the Double-link diagrams by arrows, and the relevant coefficients are placed above the arrows. For a more detailed explanation of the Double-link technique see Renfrew and Sterud (1969).

Table 168: Coefficients of Similarity for Rim Section Attributes
Rim Form

	UNI	RIF	VAN	CRA	CAM	PIP	MIL	CHY
UNI	------	193.15	189.66	187.01	180.38	177.46	176.67	168.04
RIF	193.15	------	196.51	193.86	187.23	184.32	183.52	174.89
VAN	189.66	196.51	------	197.35	190.73	187.81	187.01	178.38
CRA	187.01	193.86	197.35	------	193.38	190.46	189.66	181.03
CAM	180.38	187.23	190.73	193.38	------	195.94	195.14	186.51
PIP	177.46	184.32	187.81	190.46	195.94	------	199.20	190.57
MIL	176.67	183.52	187.01	189.66	195.14	199.20	------	191.37
CHY	168.04	174.89	178.38	181.03	186.51	190.57	191.37	------



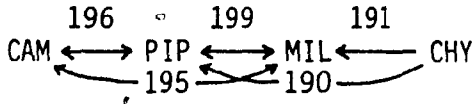
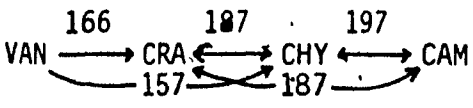


Table 169: Coefficients of Similarity for Rim Section Attributes
Rim Orientation

	VAN	CRA	CHY	CAM	MIL	UNI	RIF	PIP
VAN	------	166.00	157.32	155.17	137.12	126.50	120.35	96.12
CRA	166.00	------	187.02	187.02	166.77	160.49	151.51	128.28
CHY	157.32	187.02	------	197.85	179.76	169.18	163.03	138.80
CAM	155.17	187.02	197.85	------	179.76	171.33	164.49	140.95
MIL	137.12	166.77	179.76	179.76	------	189.37	183.23	158.99
UNI	126.50	160.49	169.18	171.33	189.37	------	191.02	167.79
RIF	120.35	151.51	163.03	164.49	183.23	191.02	------	175.77
PIP	96.12	128.28	138.80	140.95	158.99	167.79	175.77	------



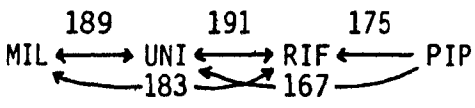


Table 170: Coefficients of Similarity for Rim Section Attributes
Exterior Rim Profile (Format 1)

	CRA	RIF	CHY	CAM	UNI	MIL	PIP	VAN
CRA	------	192.78	169.21	170.90	166.98	166.61	144.43	167.87
RIF	192.78	------	176.44	178.12	174.20	172.26	151.65	172.86
CHY	169.21	176.44	------	187.07	177.73	172.99	167.83	163.34
CAM	170.90	178.12	187.07	------	186.35	182.57	172.84	176.28
UNI	166.98	174.20	177.73	186.35	------	193.63	177.44	173.82
MIL	166.61	172.26	172.99	182.57	193.63	------	177.81	176.78
PIP	144.43	151.65	167.83	172.84	177.44	177.81	------	173.36
VAN	167.87	172.86	163.34	176.28	173.82	176.78	173.36	------

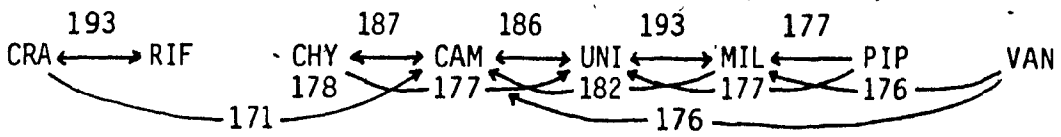


Table 171: Coefficients of Similarity for Rim Section Attributes
Interior Rim Profile (Format 1)

	CRA	CHY	UNI	RIF	VAN	MIL	PIP	CAM
CRA	------	176.06	149.44	159.98	168.04	150.78	142.13	152.41
CHY	176.06	------	167.23	172.66	170.84	159.53	155.26	157.61
UNI	149.44	167.23	------	176.46	181.27	172.48	166.24	156.09
RIF	159.98	172.66	176.46	------	183.88	181.27	167.84	149.71
VAN	168.04	170.84	181.27	183.88	------	182.74	173.81	160.48
MIL	150.78	159.53	172.48	181.27	182.74	------	176.83	158.70
PIP	142.13	155.26	166.24	167.84	173.81	176.83	------	170.68
CAM	152.41	157.61	156.09	149.71	160.48	158.70	170.68	------

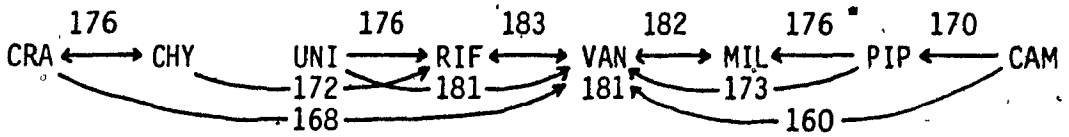


Table 172: Coefficients of Similarity for Rim Section Attributes
Angle of Lip to Interior

	CHY	CRA	VAN	UNI	RIF	PIP	CAM	MIL
CHY	------	197.54	189.08	186.22	186.98	171.04	133.83	131.51
CRA	197.54	------	190.54	185.23	185.99	170.04	132.83	130.51
VAN	189.08	190.54	------	187.63	181.02	172.45	135.24	132.91
UNI	186.22	185.23	187.63	------	189.91	184.82	147.61	145.28
RIF	186.98	185.99	181.02	189.91	------	178.32	146.85	144.52
PIP	171.04	170.04	172.45	184.82	178.32	------	162.79	160.47
CAM	133.83	132.83	135.24	147.61	146.85	162.79	------	197.67
MIL	131.51	130.51	132.91	145.28	144.52	160.47	197.67	------

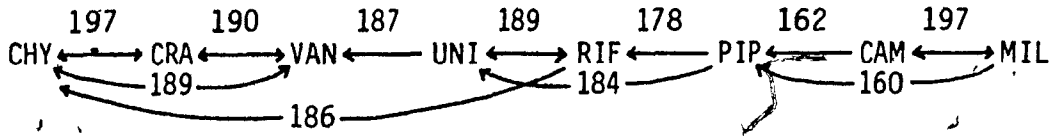


Table 173: Coefficients of Similarity for Rim Section Attributes
Collar Base Shape

	RIF	UNI	VAN	CRA	CHY	PIP	MIL	CAM
RIF	------	179.12	174.74	144.98	109.07	104.81	105.90	104.75
UNI	179.12	------	185.44	152.71	115.47	111.21	112.30	111.15
VAN	174.74	185.44	------	166.76	129.52	125.25	126.34	125.20
CRA	144.98	152.71	166.76	------	162.77	158.50	159.59	158.45
CHY	109.07	115.47	129.52	162.77	------	190.59	188.93	186.07
PIP	104.81	111.21	125.25	158.50	190.59	------	197.25	195.49
MIL	105.90	112.30	126.34	159.59	188.93	197.25	------	197.14
CAM	104.75	111.15	125.20	158.45	186.07	195.49	197.14	------

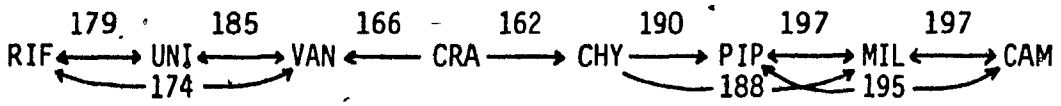


Table 174: Coefficients of Similarity for Rim Section Attributes
Collar Height (Format 1)

	UNI	CRA	VAN	MIL	CHY	PIP	RIF	CAM
UNI	------	114.38	119.42	119.30	108.81	101.12	103.45	115.31
CRA	114.38	------	133.82	126.08	95.45	98.57	103.11	124.00
VAN	119.42	133.82	------	126.34	112.32	114.99	123.30	120.95
MIL	119.30	126.08	126.34	------	129.58	129.54	136.06	129.39
CHY	108.81	95.45	112.32	129.58	------	160.99	155.49	118.37
PIP	101.12	98.57	114.99	129.54	160.99	------	164.46	136.94
RIF	103.45	103.11	123.30	136.06	155.49	164.46	------	133.37
CAM	115.31	124.00	120.95	129.39	118.37	136.94	133.37	------

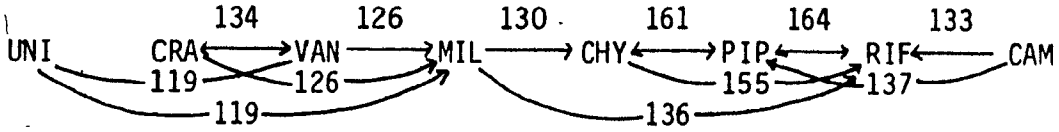


Table 175: Coefficients of Similarity for Rim Section Attributes
Lip Thickness (Format 1)

	UNI	RIF	VAN	CRA	PIP	CAM	CHY	MIL
UNI	------	145.75	132.96	140.07	128.69	128.67	104.57	121.18
RIF	145.75	------	181.38	178.01	167.75	152.95	138.10	154.36
VAN	132.96	181.38	------	182.72	170.93	147.80	142.57	148.00
CRA	140.07	178.01	182.72	------	170.92	154.02	149.53	160.37
PIP	128.69	167.75	170.93	170.92	------	171.27	166.94	164.75
CAM	128.67	152.95	147.80	154.02	171.27	------	169.48	169.22
CHY	104.57	138.10	142.57	149.53	166.94	169.48	------	161.22
MIL	121.18	154.36	148.00	160.37	164.75	169.22	161.22	------

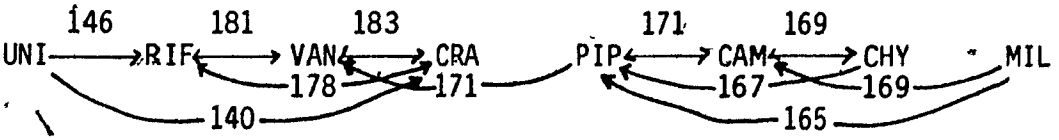


Table 176: Coefficients of Similarity for Rim Section Attributes
Collar Base Thickness (Format 1)

	UNI	CAM	CHY	RIF	PIP	MIL	CRA	VAN
UNI	------	152.39	145.12	152.93	155.72	142.93	148.88	122.77
CAM	152.39	------	170.07	160.08	169.99	162.74	162.92	152.25
CHY	145.12	170.07	------	172.76	170.96	161.08	168.53	158.26
RIF	152.93	160.08	172.76	------	176.53	169.56	167.67	161.47
PIP	155.72	169.99	170.96	176.53	------	154.51	163.46	148.25
MIL	142.93	162.74	161.08	169.56	154.51	------	173.50	161.00
CRA	148.88	162.92	168.53	167.67	163.46	173.50	------	161.30
VAN	122.77	152.25	158.26	161.47	148.25	161.00	161.30	------

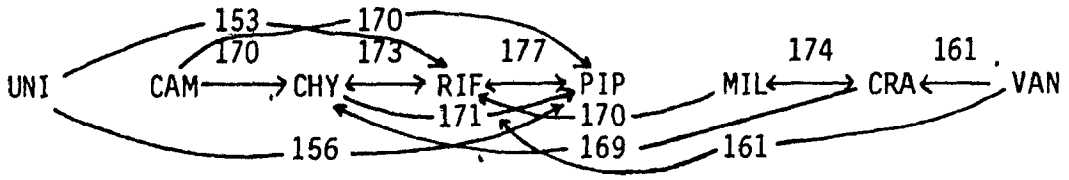


Table 177: Coefficients of Similarity for Rim Section Attributes
Rim Diameter at Lip (Format 1)

	VAN	UNI	CRA	RIF	PIP	CAM	CHY	MIL
VAN	------	73.85	97.54	101.42	79.17	75.48	96.34	75.67
UNI	73.85	------	66.00	102.11	103.27	90.86	91.60	61.86
CRA	97.54	66.00	------	124.11	113.27	127.61	121.14	117.86
RIF	101.42	102.11	124.11	------	140.71	138.84	129.81	120.72
PIP	79.17	103.27	113.27	140.71	------	144.71	135.04	127.01
CAM	75.48	90.86	127.61	138.84	144.71	------	137.95	129.68
CHY	96.34	91.60	121.14	129.81	135.04	137.95	------	124.38
MIL	75.67	61.86	117.86	120.72	127.01	129.68	124.38	------

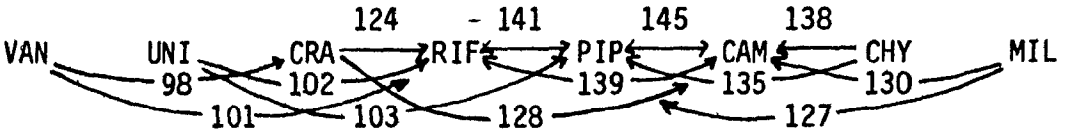


Table 178: Coefficients of Similarity for Rim Section Attributes
Interior Rim Decorative Element

	VAN	UNI	CAM	RIF	CRA	CHY	PIP	MIL
VAN	------	185.81	173.35	178.97	179.06	154.10	144.36	143.86
UNI	185.81	-------	182.52	187.79	179.60	163.27	153.53	153.03
CAM	173.35	182.52	------	190.18	181.46	173.53	163.99	163.49
RIF	178.97	187.79	190.18	------	190.72	174.47	165.39	164.89
CRA	179.06	179.60	181.46	190.72	------	175.04	165.30	164.80
CHY	154.10	163.27	173.53	174.47	175.04	------	190.26	189.75
PIP	144.36	153.53	163.99	165.39	165.30	190.26	------	199.48
MIL	143.86	153.03	163.49	164.89	164.80	189.75	199.48	------

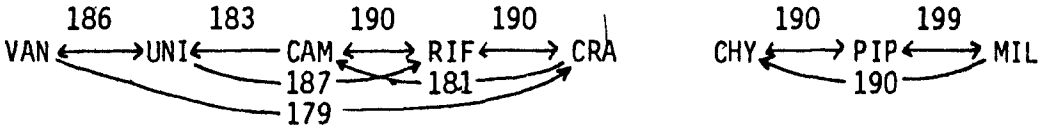


Table 179: Coefficients of Similarity for Rim Section Attributes
Interior Rim Motif

	VAN	UNI	RIF	CRA	CAM	CHY	PIP	MIL
VAN	------	169.48	175.18	168.89	156.00	149.78	143.84	141.77
UNI	169.48	------	178.50	172.43	167.58	157.79	153.53	150.94
RIF	175.18	178.50	------	185.80	178.01	172.43	165.39	163.51
CRA	168.89	172.43	185.80	------	172.74	169.89	165.30	162.71
CAM	156.00	167.58	178.01	172.74	------	170.79	163.99	163.49
CHY	149.78	157.79	172.43	169.89	170.79	------	189.74	189.75
PIP	143.84	153.53	165.39	165.30	163.99	189.74	------	197.42
MIL	141.77	150.94	163.51	162.71	163.49	189.75	197.42	------

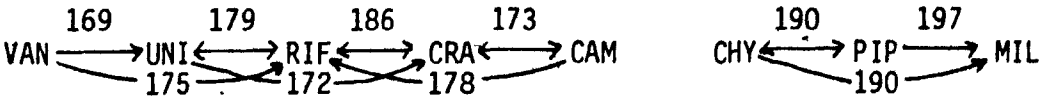


Table 180: Coefficients of Similarity for Rim Section Attributes
Lip Decorative Element

	UNI	CRA	VAN	RIF	PIP	CAM	CHY	MIL
UNI	------	175.39	149.14	148.44	143.51	135.38	133.74	133.67
CRA	175.39	------	173.75	167.48	160.92	159.98	156.98	154.24
VAN	149.14	173.75	------	191.99	187.17	186.23	183.23	180.49
RIF	148.44	167.48	191.99	------	191.35	184.84	183.20	183.13
PIP	143.51	160.92	187.17	191.35	------	191.62	190.23	190.16
CAM	135.38	159.98	186.23	184.84	191.62	------	196.99	194.25
CHY	133.74	156.98	183.23	183.20	190.23	196.99	------	197.26
MIL	133.67	154.24	180.49	183.13	190.16	194.25	197.26	------

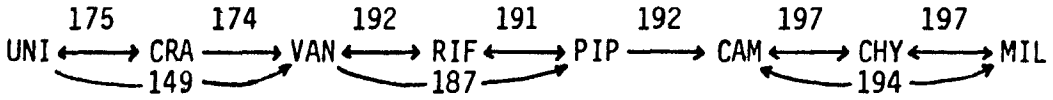


Table 181: Coefficients of Similarity for Rim Section Attributes
Lip Motif (Format 1)

	UNI	CRA	VAN	RIF	PIP	CAM	CHY	MIL
UNI	------	168.61	149.14	146.35	136.31	133.08	132.37	131.65
CRA	168.61	------	173.75	165.39	160.41	157.69	156.98	154.24
VAN	149.14	173.75	------	190.24	186.66	183.94	183.23	180.49
RIF	146.35	165.39	190.24	------	187.69	182.54	181.83	181.11
PIP	136.31	160.41	186.66	187.69	------	190.59	188.86	186.12
CAM	133.08	157.69	183.94	182.54	190.59	------	196.99	194.25
CHY	132.37	156.98	183.23	181.83	188.86	196.99	------	195.89
MIL	131.65	154.24	180.49	181.11	186.12	194.25	195.89	------

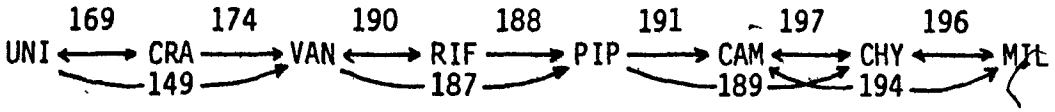


Table 182: Coefficients of Similarity for Rim Section Attributes
Upper Rim Decorative Element

	VAN	UNI	RIF	CRA	CHY	PIP	CAM	MIL
VAN	------	168.20	160.19	156.26	162.46	141.82	157.35	151.63
UNI	168.20	------	181.39	172.00	167.99	159.96	150.20	141.56
RIF	160.19	181.39	------	183.14	179.12	171.61	159.05	141.05
CRA	156.26	172.00	183.14	------	188.09	180.47	163.32	147.02
CHY	162.46	167.99	179.12	188.09	------	176.44	174.09	157.23
PIP	141.82	159.96	171.61	180.47	176.44	------	161.07	144.07
CAM	157.35	150.20	159.05	163.32	174.09	161.07	------	180.86
MIL	151.63	141.56	141.05	147.02	157.23	144.61	180.86	------

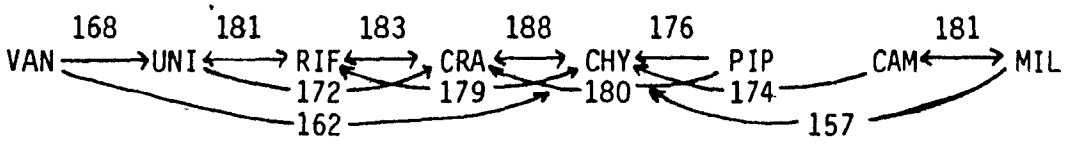


Table 183: Coefficients of Similarity for Rim Section Attributes
Upper Rim Motif (Format 1)

	UNI	CRA	RIF	VAN	PIP	CHY	CAM	MIL
UNI	------	130.89	125.98	104.85	98.21	91.83	81.29	51.11
CRA	130.89	------	139.35	123.69	114.89	100.88	86.16	69.90
RIF	125.98	139.35	------	120.89	118.37	105.47	87.89	58.08
VAN	104.85	123.69	120.89	------	128.18	101.61	109.85	70.18
PIP	98.21	114.89	118.37	128.18	------	129.82	119.52	91.19
CHY	91.83	100.88	105.47	101.61	129.82	------	101.42	75.40
CAM	81.29	86.16	87.89	109.85	119.52	101.42	------	96.86
MIL	51.11	69.90	58.08	70.18	91.19	75.40	96.86	------

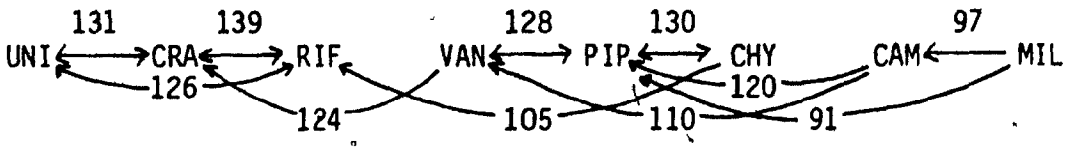


Table 184: Coefficients of Similarity for Rim Section Attributes
Secondary Rim Decoration (Format 1)

	CRA	RIF	UNI	VAN	PIP	MIL	CHY	CAM
CRA	------	182.73	176.90	176.39	174.63	171.19	172.23	174.06
RIF	182.73	------	181.62	179.02	178.15	174.13	180.22	176.50
UNI	176.90	181.62	------	188.38	185.08	183.48	176.31	177.42
VAN	176.39	179.02	188.38	------	188.69	183.91	173.97	176.00
PIP	174.63	178.15	185.08	188.69	------	184.58	179.28	177.94
MIL	171.19	174.13	183.48	183.91	184.58	------	177.34	177.43
CHY	172.23	180.22	176.31	173.97	179.28	177.34	------	184.71
CAM	174.06	176.50	177.42	176.00	177.94	177.43	184.71	------

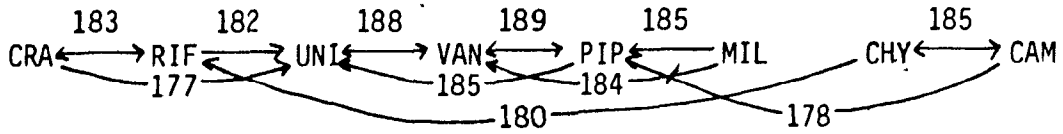


Table 185: Coefficients of Similarity for Rim Section Attributes
Neck Decorative Element (Format 1)

	UNI	CAM	RIF	VAN	CRA	MIL	PIP	CHY
UNI	------	185.19	179.78	180.72	172.07	160.37	154.07	129.27
CAM	185.19	------	189.27	189.18	178.63	172.29	161.18	141.41
RIF	179.78	189.27	------	193.66	180.64	177.80	168.06	146.71
VAN	180.72	189.18	193.66	------	185.58	176.16	165.56	145.28
CRA	172.07	178.63	180.64	185.58	------	170.88	160.80	140.00
MIL	160.37	172.29	177.80	176.16	170.88	------	188.89	168.90
PIP	154.07	161.18	168.06	165.56	160.80	188.89	------	172.53
CHY	129.27	141.41	146.71	145.28	140.00	168.90	172.53	------

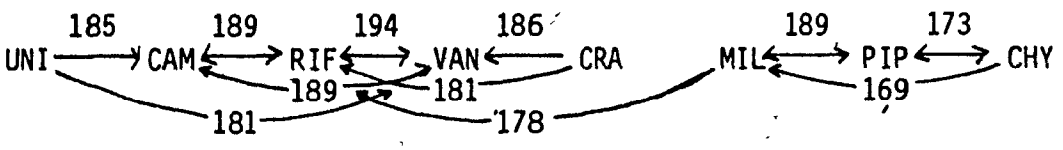


Table 186: Coefficients of Similarity for Rim Section Attributes Neck Motif (Format 1)

	CRA	UNI	CHY	PIP	RIF	CAM	VAN	MIL
CRA	------	128.63	120.36	135.50	147.31	147.37	132.55	126.78
UNI	128.63	------	108.88	138.34	152.30	147.92	142.02	133.93
CHY	120.36	108.88	------	160.56	132.43	112.65	113.87	134.55
PIP	135.50	138.34	160.56	------	157.80	138.84	136.41	155.07
RIF	147.31	152.30	132.43	157.80	------	161.67	154.60	151.89
CAM	147.37	147.92	112.65	138.84	161.67	------	166.92	159.43
VAN	132.55	142.02	113.87	136.41	154.60	166.92	------	158.76
MIL	126.78	133.93	134.55	155.07	151.89	159.43	158.76	------

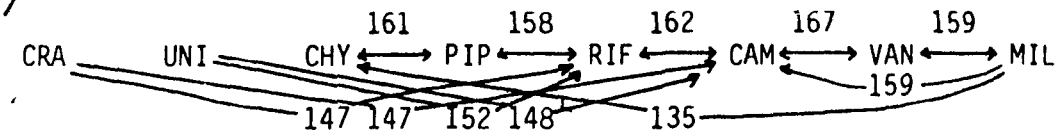


Table 187: Coefficients of Similarity for Rim Section Attributes Secondary Neck Decoration (Format 1)

	RIF	CHY	PIP	CAM	VAN	MIL	CRA	UNI
RIF	------	137.62	132.09	122.81	115.79	92.47	130.50	102.27
CHY	137.62	------	173.20	154.22	151.24	139.24	142.36	142.94
PIP	132.09	173.20	------	168.72	160.66	143.46	151.26	146.54
CAM	122.81	154.22	168.72	------	155.75	153.84	145.93	147.08
VAN	115.79	151.24	160.66	155.75	------	128.13	149.76	146.83
MIL	92.47	139.24	143.46	153.84	128.13	------	114.07	140.53
CRA	130.50	142.36	151.26	145.93	149.76	114.07	------	139.66
UNI	102.27	142.94	146.54	147.08	146.83	140.53	139.66	------

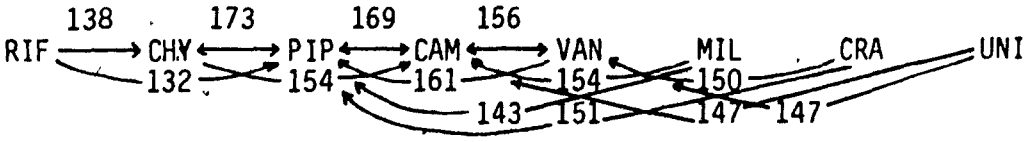


Table 188: Coefficients of Similarity for Rim Section Attributes
Exterior Rim Profile (Format 2)

	CRA	RIF	CHY	CAM	UNI	MIL	VAN	PIP
CRA	------	192.78	169.21	170.90	166.98	166.61	167.87	144.43
RIF	192.78	------	176.44	178.12	174.20	173.83	175.10	151.65
CHY	169.21	176.44	------	195.48	193.71	188.30	182.85	175.21
CAM	170.90	178.12	195.48	------	196.08	191.14	185.69	173.53
UNI	166.98	174.20	193.71	196.08	------	194.59	188.25	177.44
MIL	166.61	173.83	188.30	191.14	194.59	------	193.29	177.81
VAN	167.87	175.10	182.85	185.69	188.25	193.29	------	173.36
PIP	144.43	151.65	175.21	173.53	177.44	177.81	173.36	------

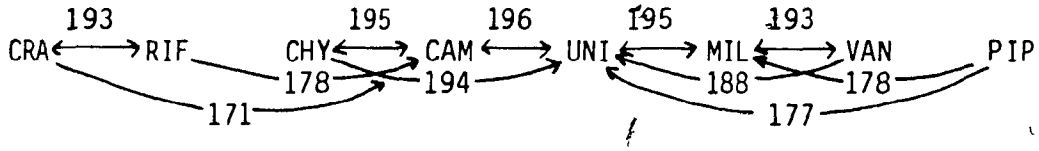


Table 189: Coefficients of Similarity for Rim Section Attributes
Interior Rim Profile (Format 2)

	RIF	CRA	CHY	VAN	MIL	UNI	PIP	CAM
RIF	------	196.00	192.09	189.22	189.43	176.46	167.84	149.71
CRA	196.00	------	194.80	191.93	193.43	180.46	170.54	152.41
CHY	192.09	194.80	------	195.63	195.03	182.06	175.74	157.61
VAN	189.22	191.93	195.63	------	197.62	186.43	178.61	160.48
MIL	189.43	193.43	195.03	197.62	------	187.03	176.83	158.70
UNI	176.46	180.46	182.06	186.43	187.03	------	171.18	156.09
PIP	167.84	170.54	175.74	178.61	176.83	171.18	------	181.87
CAM	149.71	152.41	157.61	160.48	158.70	156.09	181.87	------

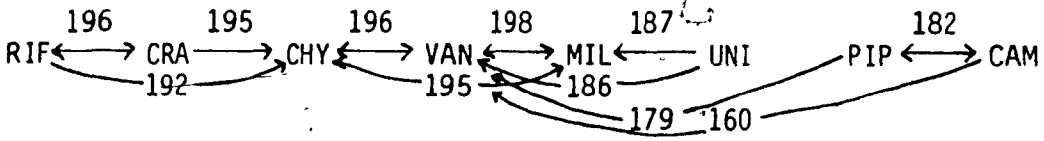
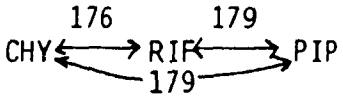


Table 190: Coefficients of Similarity for Rim Section Attributes
Collar Height (Format 2)

	CHY	RIF	PIP	CAM	VAN	MIL	CRA	UNI
CHY	------	175.85	178.83	141.99	134.83	137.42	114.69	118.01
RIF	175.85	------	179.48	146.64	142.01	142.59	117.98	123.91
PIP	178.83	179.48	------	156.04	131.92	135.72	114.43	114.81
CAM	141.99	146.64	156.04	------	161.78	161.81	147.98	146.45
VAN	134.83	142.01	131.92	161.78	------	174.19	163.50	165.91
MIL	137.42	142.59	135.72	161.81	174.19	------	172.12	170.53
CRA	114.69	117.98	114.43	147.98	163.50	172.12	------	171.95
UNI	118.01	123.91	114.81	146.45	165.91	170.53	171.95	------



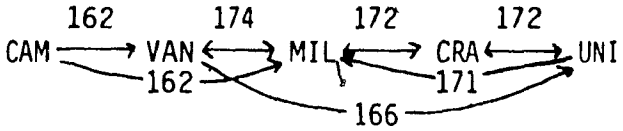
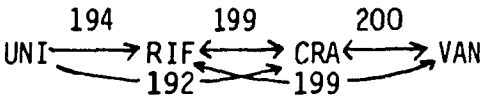


Table 191: Coefficients of Similarity for Vessel Attributes
Lip Thickness (Format 2)

	UNI	RIF	CRA	VAN	PIP	CHY	MIL	CAM
UNI	------	193.86	192.45	192.45	172.24	161.33	161.14	154.91
RIF	193.86	------	198.59	198.59	174.02	164.30	161.38	155.80
CRA	192.45	198.59	------	200.00	173.00	164.69	160.37	154.78
VAN	192.45	198.59	200.00	------	173.00	164.69	160.37	154.78
PIP	172.24	174.02	173.00	173.00	------	189.10	187.37	181.78
CHY	161.33	164.30	164.69	164.69	189.10	------	195.68	190.09
MIL	161.14	161.38	160.37	160.37	187.37	195.68	------	193.78
CAM	154.91	155.80	154.78	154.78	181.78	190.09	193.78	------



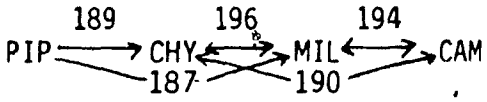
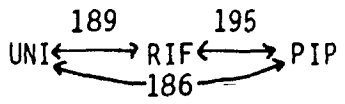


Table 192: Coefficients of Similarity for Rim Section Attributes
Collar Base Thickness (Format 2)

	UNI	RIF	PIP	CHY	CRA	VAN	CAM	MIL
UNI	------	188.61	186.20	169.35	170.50	170.56	161.87	159.97
RIF	188.61	------	195.06	180.73	181.06	178.96	171.93	170.53
PIP	186.20	195.06	------	180.64	180.68	181.36	173.16	170.16
CHY	169.35	180.73	180.64	------	197.22	195.18	188.59	187.84
CRA	170.50	181.06	180.68	197.22	------	196.64	189.46	189.47
VAN	170.56	178.96	181.36	195.18	196.64	------	190.70	188.79
CAM	161.87	171.93	173.16	188.59	189.46	190.70	------	194.90
MIL	159.97	170.53	170.16	187.84	189.47	188.79	194.90	------



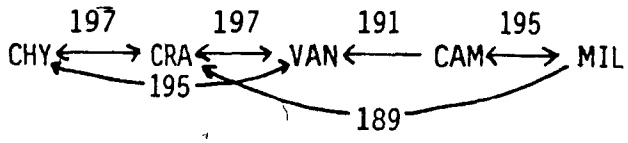


Table 193: Coefficients of Similarity for Rim Section Attributes
Rim Diameter at Lip (Format 2)

	UNI	CRA	VAN	RIF	CHY	CAM	PIP	MIL
UNI	------	116.00	160.77	150.00	121.98	127.31	132.38	117.21
CRA	116.00	------	145.85	155.21	147.36	158.62	162.38	155.91
VAN	160.77	145.85	------	167.51	126.88	136.56	139.30	132.56
RIF	150.00	155.21	167.51	------	146.41	161.30	163.69	153.37
CHY	121.98	147.36	126.88	146.41	------	178.57	162.65	159.98
CAM	127.31	158.62	136.56	161.30	178.57	------	170.69	170.79
PIP	132.38	162.38	139.30	163.69	162.65	170.69	------	172.74
MIL	117.21	155.91	132.56	153.37	159.98	170.79	172.74	------

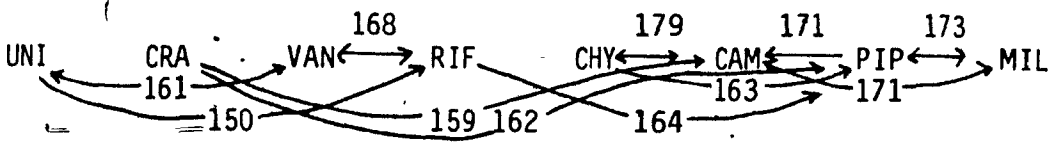


Table 194: Coefficients of Similarity for Rim Section Attributes
Interior Rim Decorative Element (Format 2)

	VAN	UNI	CRA	RIF	CAM	CHY	PIP	MIL
VAN	------	189.59	179.06	178.97	177.81	154.10	144.36	143.86
UNI	189.59	------	183.37	188.14	185.55	163.27	153.53	153.03
CRA	179.06	183.37	------	190.72	181.46	175.04	165.30	164.80
RIF	178.97	188.14	190.72	------	190.18	174.47	165.39	164.89
CAM	177.81	185.55	181.46	190.18	------	173.53	163.99	163.49
CHY	154.10	163.27	175.04	174.47	173.53	------	190.26	189.75
PIP	144.36	153.53	165.30	165.39	163.99	190.26	------	199.48
MIL	143.86	153.03	164.80	164.89	163.49	189.75	199.48	------

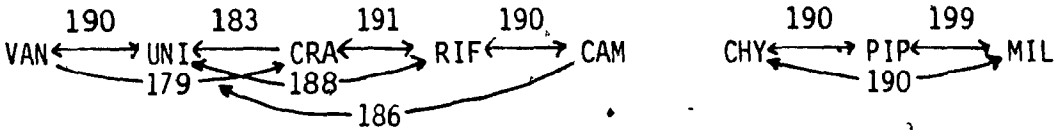


Table 195: Coefficients of Similarity for Rim Section Attributes
Interior Rim Motif (Format 2)

	VAN	UNI	CRA	RIF	CAM	CHY	MIL	PIP
VAN	------	175.73	170.54	176.16	165.16	149.99	141.77	144.36
UNI	175.73	------	174.13	181.91	173.43	157.79	150.94	153.53
CRA	170.54	174.13	------	189.72	177.95	172.30	162.71	165.30
RIF	176.16	181.91	189.72	------	186.90	172.43	163.51	165.39
CAM	165.16	173.43	177.95	186.90	------	170.99	163.49	163.99
CHY	149.99	157.79	172.30	172.43	170.99	------	189.75	189.74
MIL	141.77	150.94	162.71	163.51	163.49	189.75	------	197.42
PIP	144.36	153.53	165.30	165.39	163.99	189.74	197.42	------

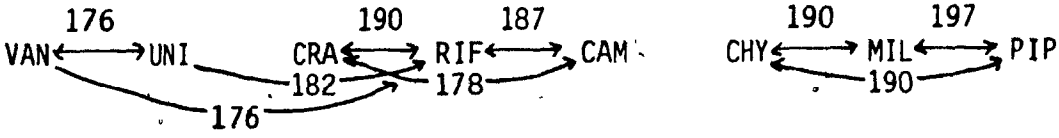


Table 196: Coefficients of Similarity for Rim Section Attributes
Lip Decorative Element (Format 2)

	UNI	CRA	VAN	RIF	PIP	CAM	CHY	MIL
UNI	------	175.39	149.14	149.84	143.51	135.38	133.74	133.67
CRA	175.39	------	173.75	167.48	160.92	159.98	156.98	154.24
VAN	149.14	173.75	------	191.99	187.17	186.23	183.23	180.49
RIF	149.84	167.48	191.99	------	192.75	184.84	183.20	183.13
PIP	143.51	160.92	187.17	192.75	------	191.62	190.23	190.16
CAM	135.38	159.98	186.23	184.84	191.62	------	196.99	194.25
CHY	133.74	156.98	183.23	183.20	190.23	196.99	------	197.26
MIL	133.67	154.24	180.49	183.13	190.16	194.25	197.26	------

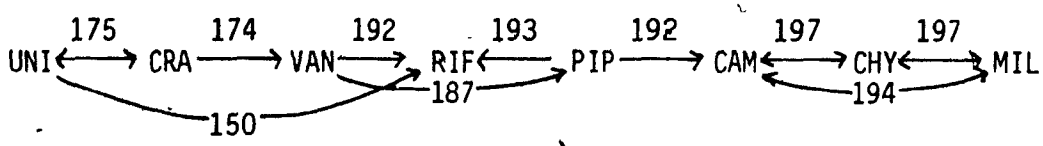


Table 197: Coefficients of Similarity for Rim Section Attributes
Lip Motif (Format 2)

	UNI	CRA	VAN	RIF	PIP	CHY	CAM	MIL
UNI	------	170.31	149.14	147.27	140.02	132.37	135.38	131.65
CRA	170.31	------	173.75	166.08	160.41	156.98	157.69	154.24
VAN	149.14	173.75	------	190.94	186.66	183.23	183.94	180.49
RIF	147.27	166.08	190.94	------	191.54	181.83	184.84	181.11
PIP	140.02	160.41	186.66	191.54	------	188.86	191.87	188.14
CHY	132.37	156.98	183.23	181.83	188.86	------	196.99	195.89
CAM	135.38	157.69	183.94	184.84	191.87	196.99	------	196.27
MIL	131.65	154.24	180.49	181.11	188.14	195.89	196.27	------

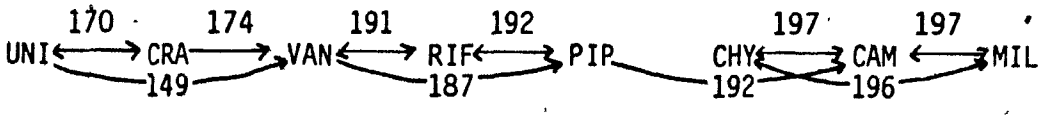


Table 198: Coefficients of Similarity for Rim Section Attributes
Upper Rim Decorative Element (Format 2)

	VAN	UNI	RIF	CRA	CHY	PIP	CAM	MIL
VAN	------	171.90	160.89	157.96	162.46	141.82	159.65	153.93
UNI	171.90	------	182.09	175.71	171.69	161.48	153.90	145.26
RIF	160.89	182.09	------	185.23	181.21	173.19	160.20	141.05
CRA	157.96	175.71	185.23	------	189.78	183.86	165.02	148.71
CHY	162.46	171.69	181.21	189.78	------	177.81	174.09	157.23
PIP	141.82	161.48	173.19	183.86	177.81	------	161.07	144.61
CAM	159.65	153.90	160.20	165.02	174.09	161.07	------	180.86
MIL	153.93	145.26	141.05	148.71	157.23	144.61	180.86	------

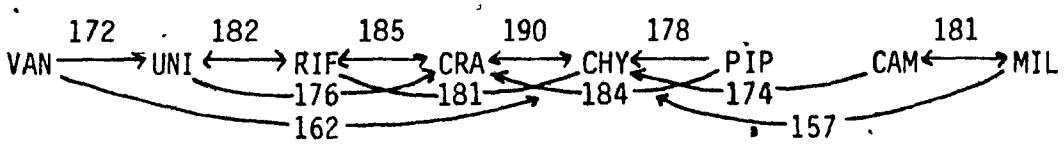


Table 199: Coefficients of Similarity for Rim Section Attributes
Upper Rim Motif (Format 2)

	UNI	VAN	CRA	RIF	PIP	CHY	CAM	MIL
UNI	------	146.10	147.08	141.71	124.66	121.46	96.15	58.81
VAN	146.10	------	149.48	148.70	140.34	126.06	123.85	74.18
CRA	147.08	149.48	------	166.24	139.93	133.97	105.04	75.90
RIF	141.71	148.70	166.24	------	135.81	136.62	102.80	71.57
PIP	124.66	140.34	139.93	135.81	------	157.25	127.24	97.70
CHY	121.46	126.06	133.97	136.62	157.25	------	122.68	95.73
CAM	96.15	123.85	105.04	102.80	127.24	122.68	------	121.14
MIL	58.81	74.18	75.90	71.57	97.70	95.73	121.14	------

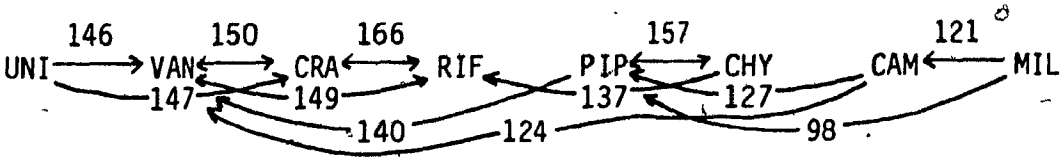


Table 200: Coefficients of Similarity for Rim Section Attributes
Secondary Rim Decoration (Format 2)

	RIF	CRA	UNI	VAN	PIP	MIL	CHY	CAM
RIF	------	186.14	183.02	183.62	179.87	174.13	182.96	179.74
CRA	186.14	------	183.99	180.99	177.36	173.19	179.73	180.29
UNI	183.02	183.99	------	191.19	187.65	183.48	180.42	180.85
VAN	183.62	180.99	191.19	------	188.69	185.91	179.01	177.16
PIP	179.87	177.36	187.65	188.69	------	185.09	183.57	181.03
MIL	174.13	173.19	183.48	185.91	185.09	------	178.71	180.29
CHY	182.96	179.73	180.42	179.01	183.57	178.71	------	188.13
CAM	179.74	180.29	180.85	177.16	181.03	180.29	188.13	------

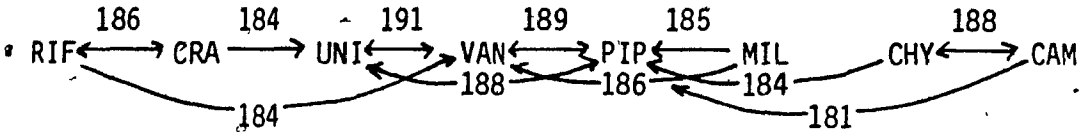


Table 201: Coefficients of Similarity for Rim Section Attributes
Neck Decorative Element (Format 2)

	UNI	CAM	RIF	VAN	CRA	MIL	PIP	CHY
UNI	------	188.89	186.27	184.42	177.46	164.07	154.58	132.98
CAM	188.89	------	192.06	189.18	180.33	172.29	161.69	141.41
RIF	186.27	192.06	------	193.66	180.94	177.80	168.06	146.71
VAN	184.42	189.18	193.66	------	187.28	176.16	166.08	145.28
CRA	177.46	180.33	180.94	187.28	------	170.88	160.80	140.00
MIL	164.07	172.29	177.80	176.16	170.88	------	187.40	168.27
PIP	154.58	161.69	168.06	166.08	160.80	187.40	------	172.53
CHY	132.98	141.41	146.71	145.28	140.00	168.27	172.53	------

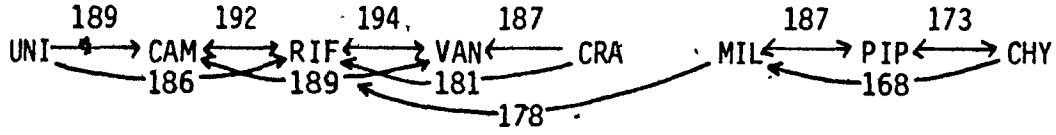


Table 202: Coefficients of Similarity for Rim Section Attributes Neck Motif (Format 2)

	UNI	RIF	CRA	CAM	VAN	PIP	CHY	MIL
UNI	------	171.07	161.58	156.78	153.51	149.44	121.46	139.93
RIF	171.07	------	167.29	166.97	164.77	165.67	138.39	158.16
CRA	161.58	167.29	------	162.00	156.52	156.08	137.26	150.51
CAM	156.78	166.97	162.00	------	184.60	145.93	126.14	161.43
VAN	153.51	164.77	156.52	184.60	------	144.58	124.44	164.16
PIP	149.44	165.67	156.08	145.93	144.58	------	169.79	156.62
CHY	121.46	138.39	137.26	126.14	124.44	169.79	------	139.92
MIL	139.93	158.16	150.51	161.43	164.16	156.62	139.92	------

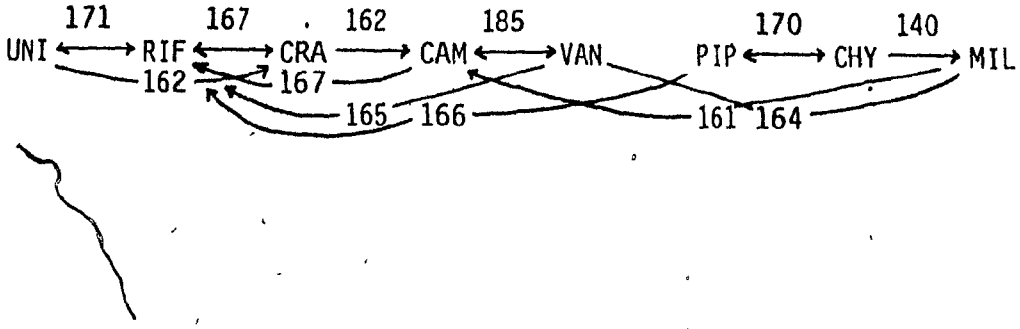


Table 203: Coefficients of Similarity for Rim Section Attributes Secondary Neck Decoration (Format 2)

	RIF	UNI	CRA	VAN	CHY	PIP	CAM	MIL
RIF	------	103.53	130.50	117.37	136.46	135.82	123.35	92.47
UNI	103.53	------	150.41	155.20	143.13	153.07	153.89	144.33
CRA	130.50	150.41	------	156.36	145.35	156.23	147.65	123.75
VAN	117.37	155.20	156.36	------	151.24	161.90	163.13	141.31
CHY	136.46	143.13	145.35	151.24	------	177.43	155.71	140.73
PIP	135.82	153.07	156.23	161.90	177.43	------	171.20	150.77
CAM	123.35	153.89	147.65	163.13	155.71	171.20	------	161.79
MIL	92.47	144.33	123.75	141.31	140.73	150.77	161.79	------

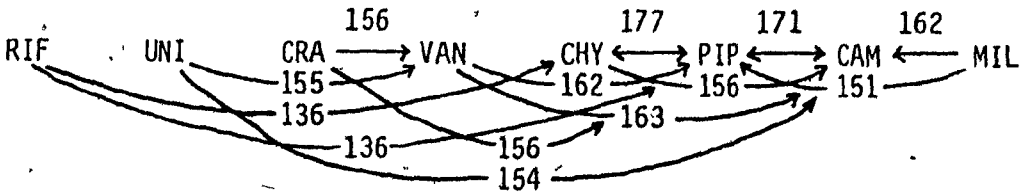


Table 204: Coefficients of Similarity for Rim Section Attributes
Interior Rim Motif (Format 3)

	VAN	UNI	CRA	RIF	CAM	CHY	PIP	MIL
VAN	------	178.27	174.79	176.86	168.08	151.36	144.36	141.77
UNI	178.27	------	174.13	181.91	173.43	160.53	153.53	150.94
CRA	174.79	174.13	------	189.72	179.76	172.30	165.30	162.71
RIF	176.86	181.91	189.72	------	187.13	173.10	165.39	163.51
CAM	168.08	173.43	179.76	187.13	------	170.99	163.99	163.49
CHY	151.36	160.53	172.30	173.10	170.99	------	190.26	189.75
PIP	144.36	153.53	165.30	165.39	163.99	190.26	------	197.42
MIL	141.77	150.94	162.71	163.51	163.49	189.75	197.42	------

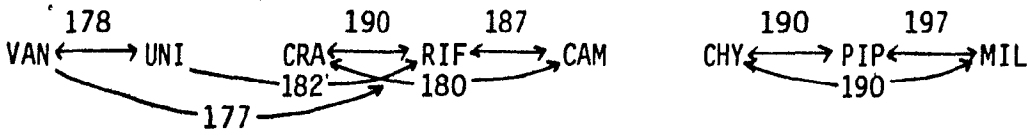


Table 205: Coefficients of Similarity for Rim Section Attributes
Lip Motif (Format 3)

	UNI	CRA	VAN	RIF	PIP	CHY	CAM	MIL
UNI	------	173.70	149.14	147.27	140.02	132.37	135.38	131.65
CRA	173.70	------	173.75	168.17	160.41	156.98	157.69	154.24
VAN	149.14	173.75	------	191.29	186.66	183.23	183.94	180.49
RIF	147.27	168.17	191.29	------	191.54	181.83	184.84	181.11
PIP	140.02	160.41	186.66	191.54	------	188.86	191.87	188.14
CHY	132.37	156.98	183.23	181.83	188.86	------	196.99	195.89
CAM	135.38	157.69	183.94	184.84	191.87	196.99	------	196.27
MIL	131.65	154.24	180.49	181.11	188.14	195.89	196.27	------

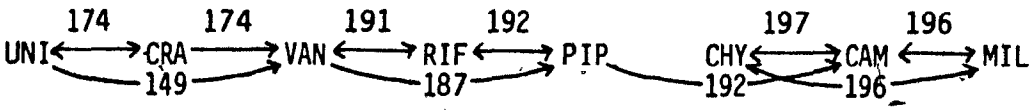


Table 206: Coefficients of Similarity for Rim Section Attributes
Upper Rim Motif (Format 3)

	UNI	RIF	CRA	VAN	PIP	CHY	CAM	MIL
UNI	------	172.41	164.21	153.07	134.06	136.66	104.00	80.60
RIF	172.41	------	175.06	158.82	143.29	149.90	109.84	84.86
CRA	164.21	175.06	------	164.39	149.34	153.50	122.59	95.97
VAN	153.07	158.82	164.39	------	158.13	145.48	137.80	114.00
PIP	134.06	143.29	149.34	158.13	------	168.25	137.36	111.69
CHY	136.66	149.90	153.50	145.48	168.25	------	133.00	111.72
CAM	104.00	109.84	122.59	137.80	137.36	133.00	------	165.35
MIL	80.60	84.86	95.97	114.00	111.69	111.72	165.35	------

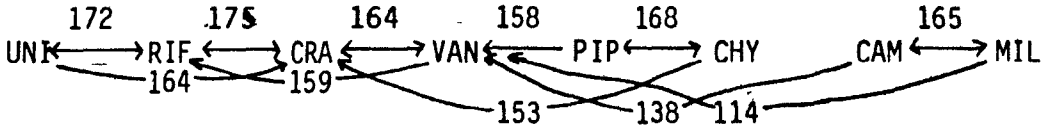


Table 207: Coefficients of Similarity for Rim Section Attributes
Secondary Rim Decoration (Format 3)

	RIF	CRA	UNI	VAN	PIP	CHY	CAM	MIL
RIF	------	186.84	183.02	183.62	182.14	185.07	181.83	175.52
CRA	186.84	------	187.70	180.99	179.26	183.12	183.13	173.19
UNI	183.02	187.70	------	191.19	188.17	181.79	181.99	183.48
VAN	183.62	180.99	191.19	------	188.69	179.01	177.16	185.91
PIP	182.14	179.26	188.17	188.69	------	187.00	181.54	185.09
CHY	185.07	183.12	181.79	179.01	187.00	------	192.48	178.71
CAM	181.83	183.13	181.99	177.16	181.54	192.48	------	181.43
MIL	175.52	173.19	183.48	185.91	185.09	178.71	181.43	------

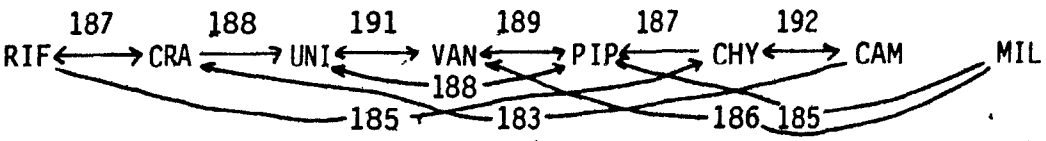


Table 208: Coefficients of Similarity for Rim Section Attributes Neck Motif (Format 3)

	RIF	CAM	VAN	UNI	CRA	MIL	PIP	CHY
RIF	------	191.61	187.90	181.54	169.98	164.93	167.91	140.46
CAM	191.61	------	190.45	189.93	176.98	163.14	162.20	138.68
VAN	187.90	190.45	------	182.45	179.62	172.70	166.74	146.19
UNI	181.54	189.93	182.45	------	170.39	155.47	153.27	131.64
CRA	169.98	176.98	179.62	170.39	------	170.88	160.80	140.00
MIL	164.93	163.14	172.70	155.47	170.88	------	186.06	167.75
PIP	167.91	162.20	166.74	153.27	160.80	186.06	------	171.67
CHY	140.46	138.68	146.19	131.64	140.00	167.75	171.67	------

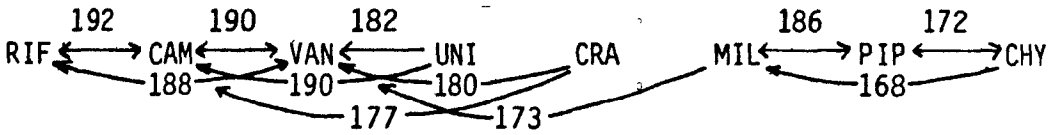


Table 209: Coefficients of Similarity for Rim Section Attributes Secondary Neck Decoration (Format 3)

	RIF	UNI	CHY	PIP	CAM	VAN	CRA	MIL
RIF	------	106.43	137.96	138.23	127.01	123.77	135.33	95.06
UNI	106.43	------	146.12	153.07	157.34	158.70	152.92	144.33
CHY	137.96	146.12	------	180.16	155.71	152.74	146.84	142.22
PIP	138.23	153.07	180.16	------	174.65	161.90	156.23	150.77
CAM	127.01	157.34	155.71	174.65	------	170.08	151.10	165.02
VAN	123.77	158.70	152.74	161.90	170.08	------	159.87	147.48
CRA	135.33	152.92	146.84	156.23	151.10	159.87	------	123.75
MIL	95.06	144.33	142.22	150.77	165.02	147.48	123.75	------

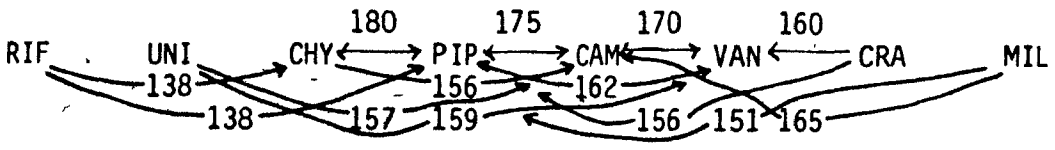


Table 210: Coefficients of Similarity for Rim Section Attributes
Interior Rim Motif (Format 4)

	CRA	RIF	CAM	UNI	VAN	CHY	PIP	MIL
CRA	------	189.72	179.76	174.13	174.79	175.04	165.30	164.80
RIF	189.72	------	187.37	183.32	178.26	175.14	165.39	164.89
CAM	179.76	187.37	------	178.53	175.85	170.99	163.99	163.49
UNI	174.13	183.32	178.53	------	178.27	163.27	153.53	153.03
VAN	174.79	178.26	175.85	178.27	------	154.10	144.36	143.86
CHY	175.04	175.14	170.99	163.27	154.10	------	190.26	189.75
PIP	165.30	165.39	163.99	153.53	144.36	190.26	------	199.48
MIL	164.80	164.89	163.49	153.03	143.86	189.75	199.48	------

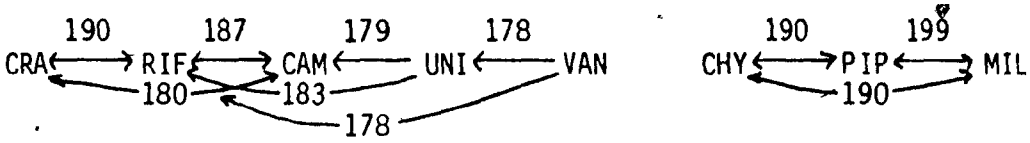


Table 211: Coefficients of Similarity for Rim Section Attributes
Lip Motif (Format 4)

	UNI	CRA	VAN	RIF	PIP	CHY	CAM	MIL
UNI	------	173.70	149.14	147.27	140.02	132.37	135.38	133.33
CRA	173.70	------	173.75	168.17	160.92	156.98	157.69	154.24
VAN	149.14	173.75	------	193.03	187.17	183.23	183.94	180.49
RIF	147.27	168.17	193.03	------	192.05	182.53	184.84	183.13
PIP	140.02	160.92	187.17	192.05	------	188.86	191.87	190.16
CHY	132.37	156.98	183.23	182.53	188.86	------	196.99	195.89
CAM	135.38	157.69	183.94	184.84	191.87	196.99	------	196.55
MIL	133.33	154.24	180.49	183.13	190.16	195.89	196.55	------

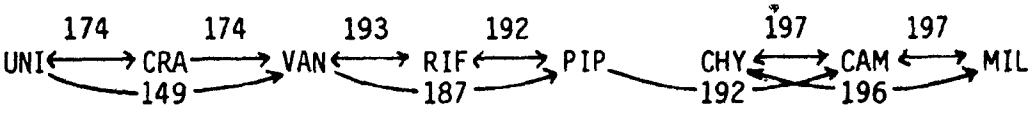


Table 212: Coefficients of Similarity for Rim Section Attributes Upper Rim Motif (Format 4)

	UNI	RIF	VAN	CRA	PIP	CHY	CAM	MIL
UNI	------	179.53	177.18	164.21	145.95	146.60	134.26	129.89
RIF	179.53	------	188.57	178.51	160.62	164.83	149.95	143.71
VAN	177.18	188.57	------	185.44	165.56	161.05	154.99	148.71
CRA	164.21	178.51	185.44	------	159.57	155.51	153.98	142.34
PIP	145.95	160.62	165.56	159.57	------	179.65	158.52	150.23
CHY	146.60	164.83	161.05	155.51	179.65	------	165.27	164.28
CAM	134.26	149.95	154.99	153.98	158.52	165.27	------	180.34
MIL	129.89	143.71	148.71	142.34	150.23	164.28	180.34	------

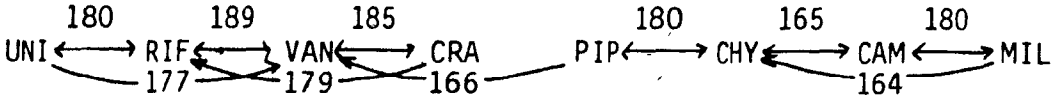


Table 213: Coefficients of Similarity for Rim Section Attributes Secondary Rim Decoration (Format 4)

	RIF	CRA	UNI	VAN	PIP	MIL	CHY	CAM
RIF	------	186.84	183.02	187.31	182.66	175.52	185.07	181.83
CRA	186.84	------	187.70	183.28	179.77	173.19	183.12	183.13
UNI	183.02	187.70	------	191.19	188.68	183.48	181.79	181.99
VAN	187.31	183.28	191.19	------	190.75	188.21	181.31	179.45
PIP	182.66	179.77	188.68	190.75	------	185.60	187.00	181.54
MIL	175.52	173.19	183.48	188.21	185.60	------	178.71	181.43
CHY	185.07	183.12	181.79	181.31	187.00	178.71	------	192.48
CAM	181.83	183.13	181.99	179.45	181.54	181.43	192.48	------

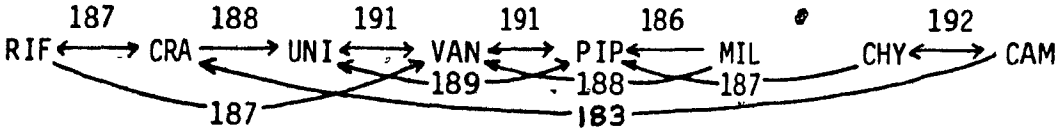


Table 214: Coefficients of Similarity for Rim Section Attributes
Neck Motif (Format 4)

	UNI	CRA	CAM	VAN	RIF	MIL	PIP	CHY
UNI	------	189.96	190.21	186.53	183.60	163.92	153.27	133.68
CRA	189.96	------	195.54	193.42	192.62	170.88	160.80	140.00
CAM	190.21	195.54	------	195.22	193.39	172.29	162.20	141.41
VAN	186.53	193.42	195.22	------	197.07	177.07	166.74	146.19
RIF	183.60	192.62	193.39	197.07	------	178.14	168.06	147.26
MIL	163.92	170.88	172.29	177.07	178.14	------	187.80	167.75
PIP	153.27	160.80	162.20	166.74	168.06	187.80	------	179.21
CHY	133.68	140.00	141.41	146.19	147.26	167.75	179.21	------

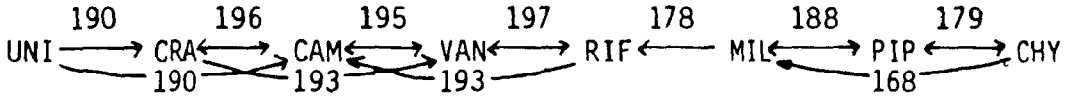


Table 215: Coefficients of Similarity for Rim Section Attributes
Secondary Neck Decoration (Format 4)

	RIF	CHY	PIP	CAM	VAN	UNI	MIL	CRA
RIF	------	144.28	138.72	130.88	129.82	111.56	103.77	136.49
CHY	144.28	------	183.02	162.61	161.25	154.23	155.13	150.68
PIP	138.72	183.02	------	177.90	168.92	158.82	160.45	158.36
CAM	130.88	162.61	177.90	------	173.11	164.19	171.25	152.82
VAN	129.82	161.25	168.92	173.11	------	178.95	150.71	169.13
UNI	111.56	154.23	158.82	164.19	178.95	------	152.69	162.30
MIL	103.77	155.13	160.45	171.25	150.71	152.69	------	131.30
CRA	136.49	150.68	158.36	152.82	169.13	162.30	131.30	------

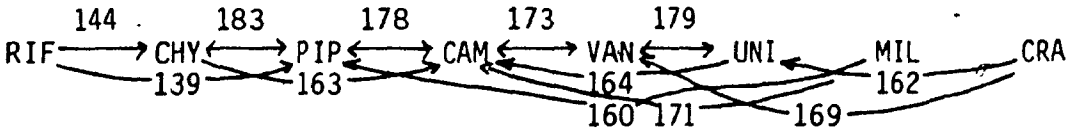


Table 216: Coefficients of Similarity for Rim Section Attributes
Interior Rim Motif (Format 5)

	RIF	CRA	CAM	UNI	VAN	CHY	PIP	MIL
RIF	------	199.90	198.60	188.14	178.97	175.14	165.39	164.89
CRA	199.90	------	198.69	188.23	179.06	175.04	165.30	164.80
CAM	198.60	198.69	------	189.54	180.37	173.73	163.99	163.49
UNI	188.14	188.23	189.54	------	190.83	163.27	153.53	153.03
VAN	178.97	179.06	180.37	190.83	------	154.10	144.36	143.86
CHY	175.14	175.04	173.73	163.27	154.10	------	190.26	189.75
PIP	165.39	165.30	163.99	153.53	144.36	190.26	------	199.50
MIL	164.89	164.80	163.49	153.03	143.86	189.75	199.50	------

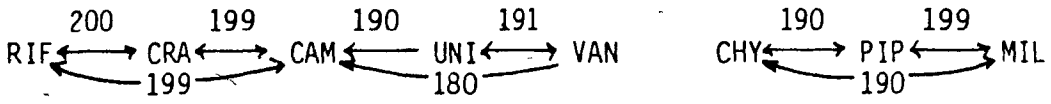


Table 217: Coefficients of Similarity for Rim Section Attributes
Lip Motif (Format 5)

	UNI	CRA	RIF	VAN	PIP	CAM	CHY	MIL
UNI	------	175.39	150.54	149.14	143.51	135.38	133.74	133.67
CRA	175.39	------	175.14	173.75	168.12	159.98	158.35	158.28
RIF	150.54	175.14	------	198.61	192.98	184.84	183.20	183.13
VAN	149.14	173.75	198.61	------	194.37	186.23	184.60	184.53
PIP	143.51	168.12	192.98	194.37	------	191.87	190.23	190.16
CAM	135.38	159.98	184.84	186.23	191.87	------	198.36	198.29
CHY	133.74	158.35	183.20	184.60	190.23	198.36	------	199.93
MIL	133.67	158.28	183.13	184.53	190.16	198.29	199.93	------

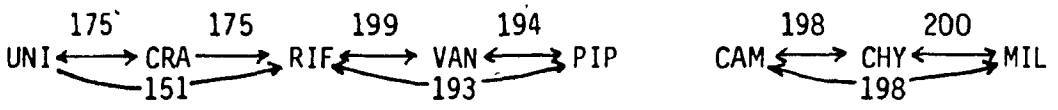


Table 218: Coefficients of Similarity for Rim Section Attributes Upper Rim Motif (Format 5)

	UNI	RIF	VAN	CRA	CHY	PIP	CAM	MIL
UNI	------	175.66	168.45	162.08	144.95	137.44	125.74	126.59
RIF	175.66	------	189.17	181.48	166.10	160.13	148.82	145.06
VAN	168.45	189.17	------	181.65	158.16	161.07	150.38	142.60
CRA	162.08	181.48	181.65	------	155.96	158.48	153.50	141.42
CHY	144.95	166.10	158.16	155.96	------	173.66	166.02	164.77
PIP	137.44	160.13	161.07	158.48	173.66	------	157.94	144.74
CAM	125.74	148.82	150.38	153.50	166.02	157.94	------	174.86
MIL	126.59	145.06	142.60	141.42	164.77	144.74	174.86	------

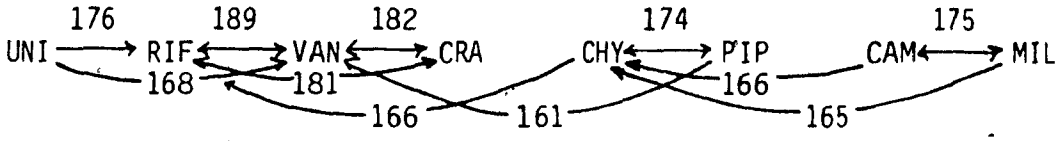


Table 219: Coefficients of Similarity for Rim Section Attributes Secondary Rim Decoration (Format 5)

	CAM	CHY	RIF	CRA	UNI	VAN	PIP	MIL
CAM	------	195.91	188.18	185.45	184.00	186.30	187.88	182.29
CHY	195.91	------	191.85	189.32	187.67	187.32	187.69	182.08
RIF	188.18	191.85	------	195.28	190.64	188.01	187.58	178.22
CRA	185.45	189.32	195.28	------	188.01	183.28	183.89	173.49
UNI	184.00	187.67	190.64	188.01	------	195.27	192.79	185.48
VAN	186.30	187.32	188.01	183.28	195.27	------	196.92	190.21
PIP	187.88	187.69	187.58	183.89	192.79	196.92	------	189.60
MIL	182.29	182.08	178.22	173.49	185.48	190.21	189.60	------

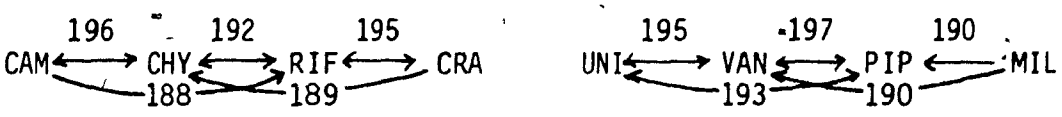


Table 220: Coefficients of Similarity for Rim Section Attributes Neck Motif (Format 5)

	UNI	CRA	RIF	VAN	CAM	MIL	PIP	CHY
UNI	------	188.70	178.19	162.71	162.50	143.93	150.99	133.79
CRA	188.70	------	187.65	171.89	170.51	150.51	160.80	141.37
RIF	178.19	187.65	------	179.05	174.97	162.16	167.91	148.63
VAN	162.71	171.89	179.05	------	193.77	176.32	155.59	136.37
CAM	162.50	170.51	174.97	193.77	------	174.29	152.50	133.46
MIL	143.93	150.51	162.16	176.32	174.29	------	160.10	142.66
PIP	150.99	160.80	167.91	155.59	152.50	160.10	------	180.58
CHY	133.79	141.37	148.63	136.37	133.46	142.66	180.58	------

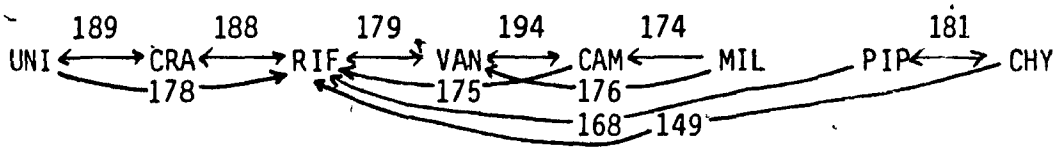


Table 221: Coefficients of Similarity for Rim Section Attributes Secondary Neck Decoration (Format 5)

	RIF	CRA	VAN	UNI	CHY	PIP	CAM	MIL
RIF	------	159.71	153.06	149.02	145.42	138.85	132.53	103.77
CRA	159.71	------	180.59	176.54	172.94	166.38	160.05	131.30
VAN	153.06	180.59	------	195.95	192.35	185.79	179.46	150.71
UNI	149.02	176.54	195.95	------	196.40	189.84	183.51	154.76
CHY	145.42	172.94	192.35	196.40	------	193.19	185.62	156.86
PIP	138.85	166.38	185.79	189.84	193.19	------	192.43	163.67
CAM	132.53	160.05	179.46	183.51	185.62	192.43	------	171.25
MIL	103.77	131.30	150.71	154.76	156.86	163.67	171.25	------

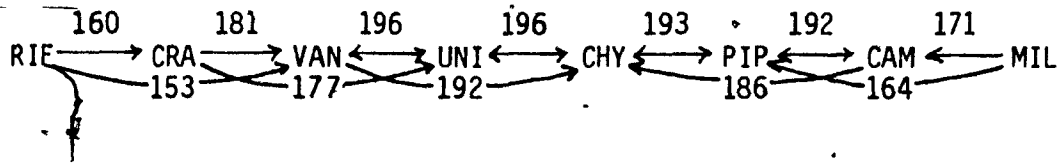


Table 222: Coefficients of Similarity for Rim Section Attributes Secondary Rim Decoration (Format 6)

	RIF	CAM	CHY	CRA	UNI	PIP	VAN	MIL
RIF	------	198.61	198.41	196.67	191.34	189.27	188.91	184.82
CAM	198.61	------	199.80	198.06	189.95	187.88	187.52	183.43
CHY	198.41	199.80	------	198.26	189.75	187.69	187.32	183.23
CRA	196.67	198.06	198.26	------	188.01	185.94	185.58	181.49
UNI	191.34	189.95	189.75	188.01	------	197.93	197.57	193.48
PIP	189.27	187.88	187.69	185.94	197.93	------	199.64	195.55
VAN	188.91	187.52	187.32	185.58	197.57	199.64	------	195.91
MIL	184.82	183.43	183.23	181.49	193.48	195.55	195.91	------

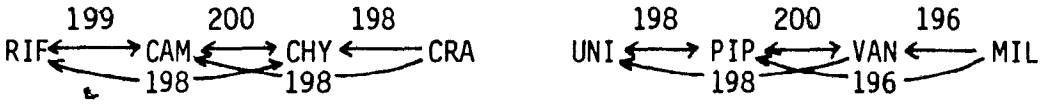


Table 223: Coefficients of Similarity for Rim Section Attributes Neck Motif (Format 6)

	UNI	CRA	CAM	VAN	RIF	MIL	PIP	CHY
UNI	------	193.79	192.38	188.51	186.53	166.67	154.58	135.16
CRA	193.79	------	198.60	194.72	192.74	172.88	160.80	141.37
CAM	192.38	198.60	------	196.12	194.15	174.29	162.20	142.78
VAN	188.51	194.72	196.12	------	198.02	178.16	166.08	146.65
RIF	186.53	192.74	194.15	198.02	------	180.14	168.06	148.63
MIL	166.67	172.88	174.29	178.16	180.14	------	187.92	168.49
PIP	154.58	160.80	162.20	166.08	168.06	187.92	------	180.58
CHY	135.16	141.37	142.78	146.65	148.63	168.49	180.58	------

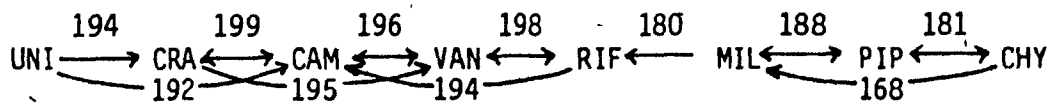


Table 224: Coefficients of Similarity for Rim Section Attributes
Secondary Neck Decoration (Format 6)

	RIF	CRA	VAN	UNI	CHY	PIP	CAM	MIL
RIF	------	172.47	153.06	149.02	146.91	140.10	132.53	103.77
CRA	172.47	------	180.59	176.54	174.44	167.62	160.05	131.30
VAN	153.06	180.59	------	195.95	193.85	187.03	179.46	150.71
UNI	149.02	176.54	195.95	------	197.90	191.08	183.51	154.76
CHY	146.91	174.44	193.85	197.90	------	193.19	185.62	156.86
PIP	140.10	167.62	187.03	191.08	193.19	------	192.43	163.67
CAM	132.53	160.05	179.46	183.51	185.62	192.43	------	171.25
MIL	103.77	131.30	150.71	154.76	156.86	163.67	171.25	------

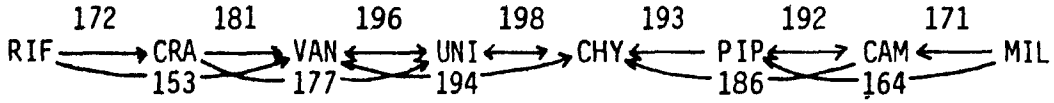


Table 225: Coefficients of Similarity for Pipe Bowl Section Attributes
Exterior Bowl Orientation (Format 1)

	VAN	CHY	PIP	CAM	RIF	UNI	CRA	MIL
VAN	------	197.91	186.86	180.65	165.07	149.00	145.43	129.26
CHY	197.91	------	188.94	180.65	167.16	151.09	147.52	131.35
PIP	186.86	188.94	------	186.36	177.86	156.43	152.86	142.41
CAM	180.65	180.65	186.36	------	165.78	150.81	147.24	137.52
RIF	165.07	167.16	177.86	165.78	------	178.57	175.00	152.73
UNI	149.00	151.09	156.43	150.81	178.57	------	191.07	147.37
CRA	145.43	147.52	152.86	147.24	175.00	191.07	------	147.37
MIL	129.26	131.35	142.41	137.52	152.73	147.37	147.37	------

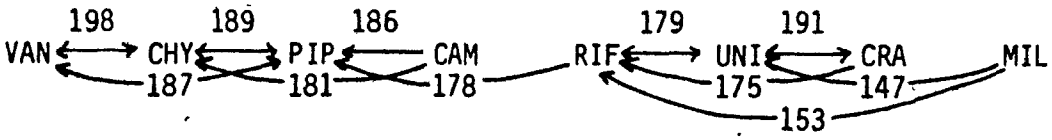
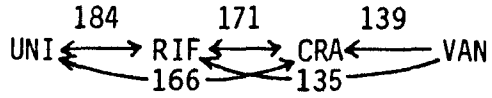


Table 226: Coefficients of Similarity for Pipe Bowl Section Attributes Exterior Bowl Profile (Format 1)

	UNI	RIF	CRA	VAN	CAM	CHY	PIP	MIL
UNI	------	183.93	166.07	126.50	51.61	60.87	71.43	115.79
RIF	183.93	------	171.43	135.43	56.97	68.01	78.57	121.15
CRA	166.07	171.43	------	139.14	51.61	60.87	71.43	112.78
VAN	126.50	135.43	139.14	------	51.61	60.87	60.57	115.79
CAM	51.61	56.97	51.61	51.61	------	165.87	152.17	135.82
CHY	60.87	68.01	60.87	60.87	165.87	------	183.56	145.08
PIP	71.43	78.57	71.43	60.57	152.17	183.56	------	144.36
MIL	115.79	121.15	112.78	115.79	135.82	145.08	144.36	------



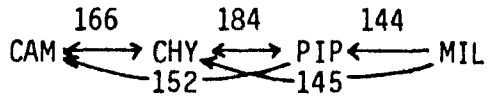


Table 227: Coefficients of Similarity for Pipe Bowl Section Attributes Interior Bowl Profile (Format 1)

	UNI	RIF	CRA	PIP	CHY	VAN	MIL	CAM
UNI	------	167.00	169.64	145.36	140.76	134.50	136.18	94.76
RIF	167.00	------	196.78	167.62	162.32	165.69	167.38	125.95
CRA	169.64	196.78	------	170.00	164.70	164.86	166.54	125.12
PIP	145.36	167.62	170.00	------	194.70	167.43	161.95	149.40
CHY	140.76	162.32	164.70	194.70	------	166.72	158.35	151.10
VAN	134.50	165.69	164.86	167.43	166.72	------	186.53	152.26
MIL	136.18	167.38	166.54	161.95	158.35	186.53	------	158.57
CAM	94.76	125.95	125.12	149.40	151.10	152.26	158.57	------

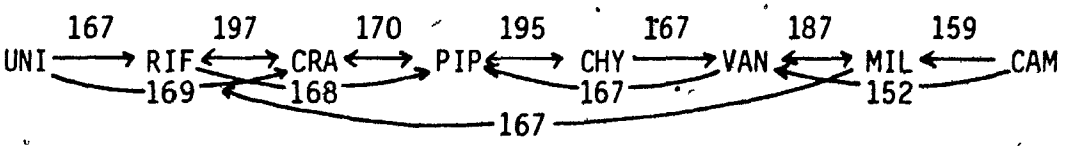


Table 228: Coefficients of Similarity for Pipe Bowl Section Attributes
Angle of Lip to Interior (Format 1)

	CHY	RIF	PIP	CAM	UNI	CRA	VAN	MIL
CHY	------	184.07	174.41	170.23	158.70	154.45	142.03	106.33
RIF	184.07	------	185.90	181.72	170.18	170.38	157.96	122.26
PIP	174.41	185.90	------	192.97	181.43	177.14	164.72	129.02
CAM	170.23	181.72	192.97	------	188.46	181.32	165.22	133.20
UNI	158.70	170.18	181.43	188.46	------	185.71	165.22	144.74
CRA	154.45	170.38	177.14	181.32	185.71	------	179.50	151.88
VAN	142.03	157.96	164.72	165.22	165.22	179.50	------	164.30
MIL	106.33	122.26	129.02	133.20	144.74	151.88	164.30	------

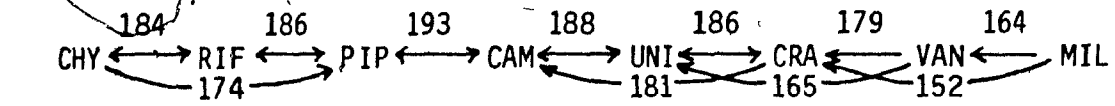


Table 229: Coefficients of Similarity for Pipe Bowl Section Attributes
Lip Thickness (Format 1)

	UNI	PIP	CAM	CHY	RIF	CRA	VAN	MIL
UNI	------	167.62	146.67	148.99	120.61	83.81	100.29	105.26
PIP	167.62	------	176.19	158.76	141.04	100.00	117.89	105.26
CAM	146.67	176.19	------	148.99	137.58	113.33	102.32	90.88
CHY	148.99	158.76	148.99	------	143.93	99.07	104.35	116.09
RIF	120.61	141.04	137.58	143.93	------	131.69	124.51	106.89
CRA	83.81	100.00	113.33	99.07	131.69	------	145.65	81.95
VAN	100.29	117.89	102.32	104.35	124.51	145.65	------	118.54
MIL	105.26	105.26	90.88	116.09	106.89	81.95	118.54	------

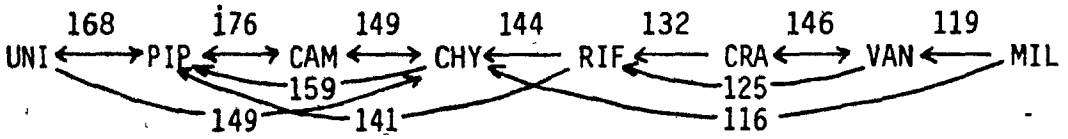


Table 230: Coefficients of Similarity for Pipe Bowl Section Attributes
Bowl Decorative Element (Format 1)

	CRA	VAN	RIF	UNI	CHY	CAM	PIP	MIL
CRA	------	198.57	185.71	116.07	113.35	143.09	158.57	162.78
VAN	198.57	------	187.14	117.50	114.78	144.52	160.00	164.21
RIF	185.71	187.14	------	128.57	120.50	150.23	165.71	169.92
UNI	116.07	117.50	128.57	------	172.28	172.98	157.50	153.29
CHY	113.35	114.78	120.50	172.28	------	170.27	154.78	150.57
CAM	143.09	144.52	150.23	172.98	170.27	------	184.52	180.31
PIP	158.57	160.00	165.71	157.50	154.78	184.52	------	195.79
MIL	162.78	164.21	169.92	153.29	150.57	180.31	195.79	------

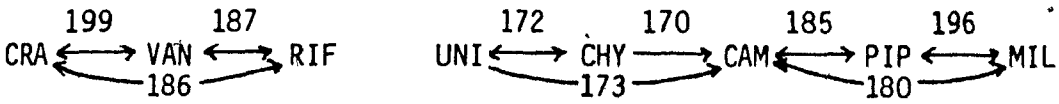


Table 231: Coefficients of Similarity for Pipe Bowl Section Attributes
Bowl Motif (Format 1)

	VAN	RIF	CRA	UNI	CHY	CAM	PIP	MIL
VAN	------	124.50	107.14	105.00	85.80	92.90	80.00	90.53
RIF	124.50	------	126.79	114.29	102.23	111.12	102.86	98.03
CRA	107.14	126.79	------	110.71	111.80	124.42	131.43	103.38
UNI	105.00	114.29	110.71	------	143.30	148.39	131.43	126.32
CHY	85.80	102.23	111.80	143.30	------	170.27	148.94	127.38
CAM	92.90	111.12	124.42	148.39	170.27	------	153.64	132.77
PIP	80.00	102.86	131.43	131.43	148.94	153.64	------	135.79
MIL	90.53	98.03	103.38	126.32	127.38	132.77	135.79	------

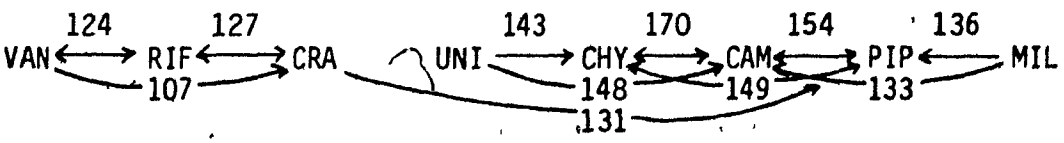
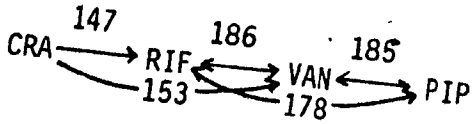


Table 232: Coefficients of Similarity for Pipe Bowl Section Attr
Secondary Bowl Decoration (Format 1)

	CRA	RIF	VAN	PIP	UNI	CAM	CHY	M
CRA	------	147.31	152.78	140.58	114.29	113.79	111.94	100
RIF	147.31	------	185.66	178.49	162.67	162.18	160.33	148.
VAN	152.78	185.66	------	185.02	155.56	158.24	156.38	144.
PIP	140.58	178.49	185.02	------	153.62	167.42	165.56	153.
UNI	114.29	162.67	155.56	153.62	------	185.71	185.71	185.
CAM	113.79	162.18	158.24	167.42	185.71	------	198.15	186.
CHY	111.94	160.33	156.38	165.56	185.71	198.15	------	188.
MIL	100.00	148.39	144.44	153.62	185.71	186.21	188.06	------



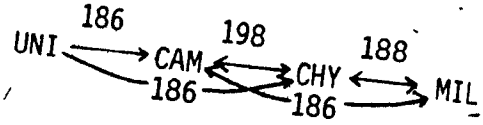
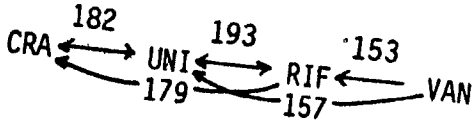


Table 233: Coefficients of Similarity for Pipe Bowl Section Attribute
Exterior Bowl Profile (Format 2)

	CRA	UNI	RIF	VAN	CAM	CHY	PIP	MIL
CRA	------	182.14	178.57	139.14	51.61	60.87	71.43	115.79
UNI	182.14	------	192.86	157.00	51.61	60.87	71.43	115.79
RIF	178.57	192.86	------	153.43	58.76	68.01	78.57	122.93
VAN	139.14	157.00	153.43	------	51.61	60.87	60.57	115.79
CAM	51.61	51.61	58.76	51.61	------	177.47	163.59	135.82
CHY	60.87	60.87	68.01	60.87	177.47	------	186.13	145.08
PIP	71.43	71.43	78.57	60.57	163.59	186.13	------	144.36
MIL	115.79	122.93	115.79	115.79	145.08	135.82	144.36	------



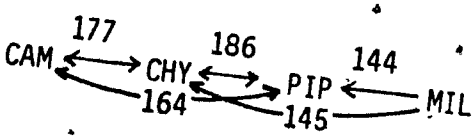


Table 234: Coefficients of Similarity for Pipe Bowl Section Attributes
Interior Bowl Profile (Format 2)

	UNI	RIF	CRA	MIL	VAN	PIP	CHY	CAM
UNI	------	177.36	176.79	175.66	168.50	146.79	141.49	138.31
RIF	177.36	------	197.62	196.49	191.14	167.62	164.12	159.14
CRA	176.79	197.62	------	198.87	191.71	170.00	164.70	161.52
MIL	175.66	196.49	198.87	------	192.00	171.13	165.83	162.65
VAN	168.50	191.14	191.71	192.00	------	170.29	167.88	161.81
PIP	146.79	167.62	170.00	171.13	170.29	------	194.70	191.52
CHY	141.49	164.12	164.70	165.83	167.88	194.70	------	193.92
CAM	138.31	159.14	161.52	162.65	161.81	191.52	193.92	------

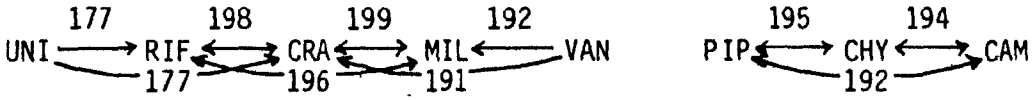


Table 235: Coefficients of Similarity for Pipe Bowl Section Attributes
Lip Thickness (Format 2)

	CRA	RIF	VAN	UNI	CHY	PIP	MIL	CAM
CRA	------	172.21	172.05	168.57	157.56	157.14	149.62	141.90
RIF	172.21	------	195.97	187.27	176.26	175.84	168.33	160.61
VAN	172.05	195.97	------	187.83	176.81	176.40	168.88	161.16
UNI	168.57	187.27	187.83	------	188.99	188.57	181.05	173.33
CHY	157.56	176.26	176.81	188.99	------	199.59	192.07	184.35
PIP	157.14	175.84	176.40	188.57	199.59	------	192.48	184.76
MIL	149.62	168.33	168.88	181.05	192.07	192.48	------	192.28
CAM	141.90	160.61	161.16	173.33	184.35	184.76	192.28	------

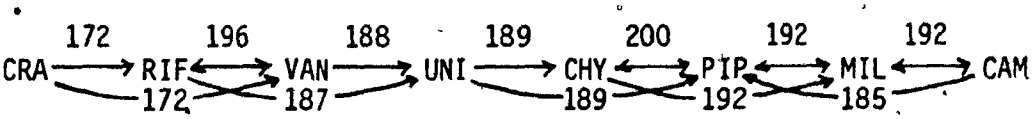


Table 236: Coefficients of Similarity for Pipe Bowl Section Attributes
Bowl Motif (Format 2)

	VAN	RIF	CRA	PIP	MIL	CAM	CHY	UNI
VAN	------	167.21	122.29	93.71	98.53	107.35	93.80	113.00
RIF	167.21	------	139.29	114.64	119.45	125.40	114.73	123.21
CRA	122.29	139.29	------	155.71	162.78	130.18	113.35	116.07
PIP	93.71	114.64	155.71	------	192.33	161.57	151.84	135.36
MIL	98.53	119.45	162.78	192.33	------	165.03	150.57	138.82
CAM	107.35	125.40	130.18	161.57	165.03	------	170.27	160.89
CHY	93.80	114.73	113.35	151.84	150.57	170.27	------	155.80
UNI	113.00	123.21	116.07	135.36	138.82	160.89	155.80	------

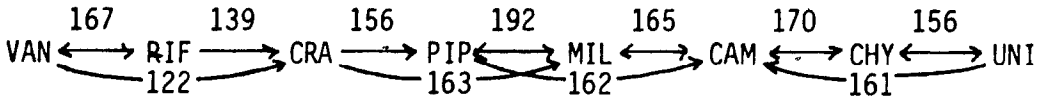
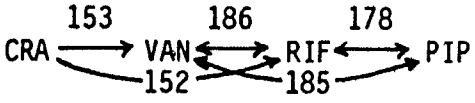


Table 237: Coefficients of Similarity for Pipe Bowl Section Attributes
Secondary Bowl Decoration (Format 2)

	CRA	VAN	RIF	PIP	UNI	CAM	CHY	MIL
CRA	------	152.78	151.61	140.58	114.29	113.79	111.94	100.00
VAN	152.78	------	185.66	185.02	155.56	158.24	156.38	144.44
RIF	151.61	185.66	------	178.49	162.67	162.18	160.33	148.39
PIP	140.58	185.02	178.49	------	153.62	167.42	165.56	153.62
UNI	114.29	155.56	162.67	153.62	------	185.71	185.71	185.71
CAM	113.79	158.24	162.18	167.42	185.71	------	198.15	186.21
CHY	111.94	156.38	160.33	165.56	185.71	198.15	------	188.06
MIL	100.00	144.44	148.39	153.62	185.71	186.21	188.06	------



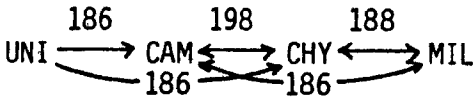


Table 238: Coefficients of Similarity for Pipe Bowl Section Attributes Bowl Motif (Format 3)

	VAN	RIF	CRA	PIP	MIL	CAM	CHY	UNI
VAN	------	167.21	122.29	93.71	98.53	107.35	93.80	113.00
RIF	167.21	------	139.29	114.64	119.45	125.40	114.73	125.00
CRA	122.29	139.29	------	155.71	162.78	136.64	113.35	116.07
PIP	93.71	114.64	155.71	------	192.33	168.02	151.84	135.36
MIL	98.53	119.45	162.78	192.33	------	171.48	150.57	138.82
CAM	107.35	125.40	136.64	168.02	171.48	------	170.27	160.89
CHY	93.80	114.73	113.35	151.84	150.57	170.27	------	155.80
UNI	113.00	125.00	116.07	135.36	138.82	160.89	155.80	------

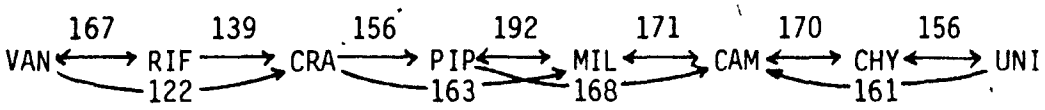
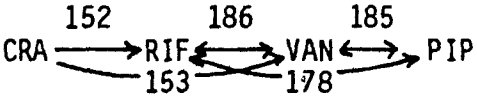


Table 239: Coefficients of Similarity for Pipe Bowl Section Attributes Secondary Bowl Decoration (Format 3)

	CRA	RIF	VAN	PIP	UNI	CAM	CHY	MIL
CRA	------	151.61	152.78	140.58	114.29	113.79	111.94	100.00
RIF	151.61	------	185.66	178.49	162.67	162.18	160.33	148.39
VAN	152.78	185.66	------	185.02	155.56	158.24	156.38	144.44
PIP	140.58	178.49	185.02	------	153.62	167.42	165.56	153.62
UNI	114.29	162.67	155.56	153.62	------	185.71	185.71	185.71
CAM	113.79	162.18	158.24	167.42	185.71	------	198.15	186.21
CHY	111.94	160.33	156.38	165.56	185.71	198.15	------	188.06
MIL	100.00	148.39	144.44	153.62	185.71	186.21	188.06	------



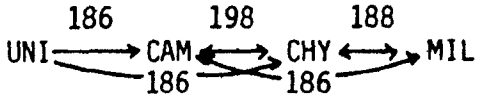


Table 240: Coefficients of Similarity for Pipe Bowl Section Attributes Bowl Motif (Format 4)

	VAN	RIF	CRA	PIP	MIL	CAM	CHY	UNI
VAN	------	167.21	122.29	93.71	98.53	107.35	93.80	113.00
RIF	167.21	------	139.29	114.64	119.45	125.40	114.73	128.57
CRA	122.29	139.29	------	155.71	162.78	136.64	113.35	116.07
PIP	93.71	114.64	155.71	------	192.33	168.02	151.84	135.36
MIL	98.53	119.45	162.78	192.33	------	171.48	150.57	138.82
CAM	107.35	125.40	136.64	168.02	171.48	------	170.27	160.89
CHY	93.80	114.73	113.35	151.84	150.57	170.27	------	155.80
UNI	113.00	128.57	116.07	135.36	138.82	160.89	155.80	------

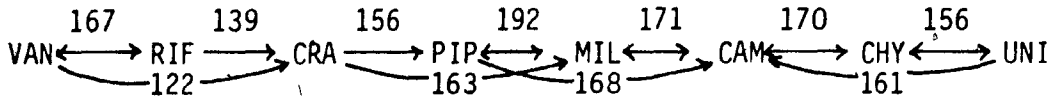


Table 241: Coefficients of Similarity for Pipe Bowl Section Attributes Secondary Bowl Decoration (Format 4)

	CRA	RIF	VAN	PIP	UNI	CAM	CHY	MIL
CRA	------	151.61	155.56	140.58	114.29	113.79	111.94	100.00
RIF	151.61	------	196.06	188.97	162.67	162.18	160.33	148.39
VAN	155.56	196.06	------	185.02	158.73	158.24	156.38	144.44
PIP	140.58	188.97	185.02	------	167.91	167.42	165.56	153.62
UNI	114.29	162.67	158.73	167.91	------	199.51	197.65	185.71
CAM	113.79	162.18	158.24	167.42	199.51	------	198.15	186.21
CHY	111.94	160.33	156.38	165.56	197.65	198.15	------	188.06
MIL	100.00	148.39	144.44	153.62	185.71	186.21	188.06	------

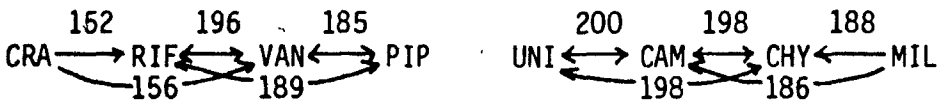


Table 242: Coefficients of Similarity for Pipe Bowl Section Attributes Bowl Motif (Format 5)

	VAN	RIF	CRA	PIP	MIL	CAM	CHY	UNI
VAN	------	169.00	129.43	93.71	98.53	107.35	93.80	138.00
RIF	169.00	------	142.86	114.64	119.45	127.19	114.73	148.21
CRA	129.43	142.86	------	155.71	162.78	143.09	113.35	126.79
PIP	93.71	114.64	155.71	------	192.33	168.02	151.84	135.36
MIL	98.53	119.45	162.78	192.33	------	171.48	150.57	138.82
CAM	107.35	127.19	143.09	168.02	171.48	------	170.27	160.89
CHY	93.80	114.73	113.35	151.84	150.57	170.27	------	155.80
UNI	128.00	141.21	126.79	135.36	138.82	160.89	155.80	------

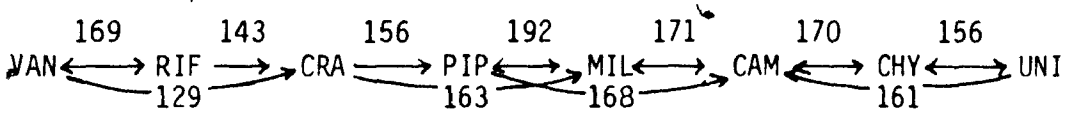
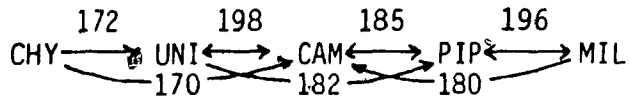


Table 243: Coefficients of Similarity for Pipe Bowl Section Attributes Secondary Bowl Decoration (Format 5)

	CRA	RIF	VAN	PIP	UNI	CAM	CHY	MIL
CRA	------	151.61	155.56	140.58	114.29	113.79	111.94	100.00
RIF	151.61	------	196.06	188.97	162.67	162.18	160.33	148.39
VAN	155.56	196.06	------	185.02	158.73	158.24	156.38	144.44
PIP	140.58	188.97	185.02	------	167.91	167.42	165.56	153.62
UNI	114.29	162.67	158.73	167.91	------	199.51	197.65	185.71
CAM	113.79	162.18	158.24	167.42	199.51	------	198.15	186.21
CHY	111.94	160.33	156.38	165.56	197.65	198.15	------	188.06
MIL	100.00	148.39	144.44	153.62	185.71	186.21	188.06	------

Table 244: Coefficients of Similarity for Pipe Bowl Section Attributes Bowl Motif (Format 6)

	CHY	UNI	CAM	PIP	MIL	RIF	VAN	CRA
CHY	------	172.28	170.27	154.78	150.57	120.50	114.78	113.35
UNI	172.28	------	197.98	182.50	178.29	148.21	142.50	141.07
CAM	170.27	197.98	------	184.52	180.31	150.23	144.52	143.09
PIP	154.78	182.50	184.52	------	195.79	165.71	160.00	158.57
MIL	150.57	178.29	180.31	195.79	------	169.92	164.21	162.78
RIF	120.50	148.21	150.23	165.71	169.92	------	194.29	192.86
VAN	114.78	142.50	144.52	160.00	164.21	194.29	------	198.57
CRA	113.35	141.07	143.09	158.57	162.78	192.86	198.57	------



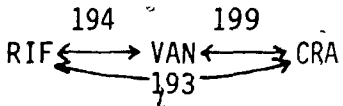
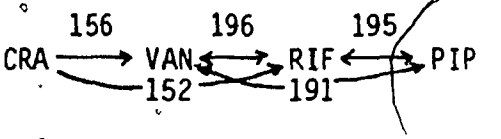


Table 245: Coefficients of Similarity for Pipe Bowl Section Attributes Secondary Bowl Decoration (Format 6)

	CRA	VAN	RIF	PIP	UNI	CAM	CHY	MIL
CRA	------	155.56	151.61	146 38	114.29	113.79	111.94	100.00
VAN	155.56	------	196.06	190.82	158.73	158.24	156.38	144.44
RIF	151.61	196.06	------	194.76	162.67	162.18	160.33	148.39
PIP	146.38	190.82	194.76	------	167.91	167.42	165.56	153.62
UNI	114.29	158.73	162.67	167.91	------	199.51	197.65	185.71
CAM	113.79	158.24	162.18	167.42	199.51	------	198.15	186.21
CHY	111.94	156.38	160.33	165.56	197.65	198.15	------	188.06
MIL	100.00	144.44	148.39	153.62	185.71	186.21	188.06	------



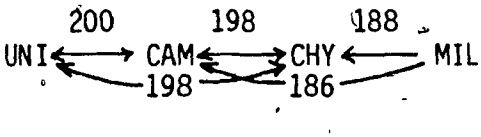


Figure 58: Dendrogram for Rim Section Attributes
Rim Form (Format 1)

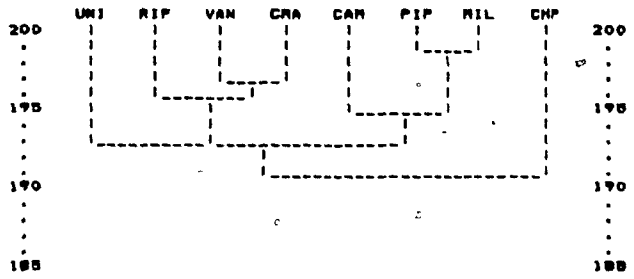


Figure 59: Dendrogram for Rim Section Attributes
Rim Orientation (Format 1)

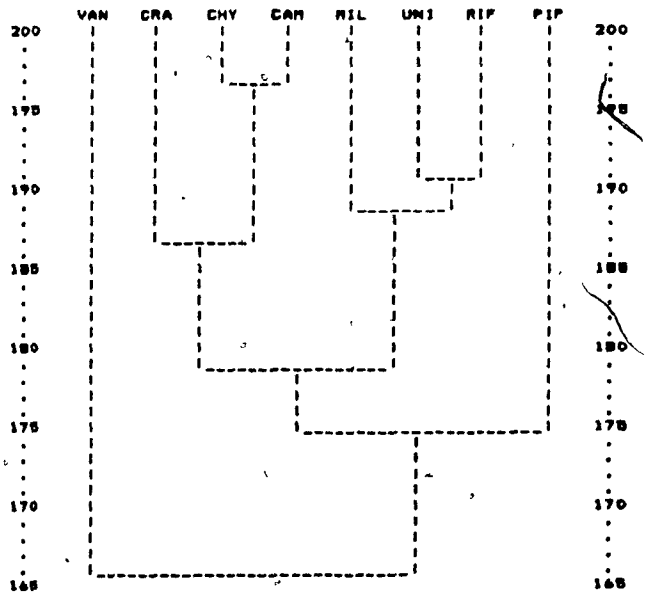


Figure 60: Dendrogram for Rim Section Attributes
Exterior Rim Profile (Format 1)

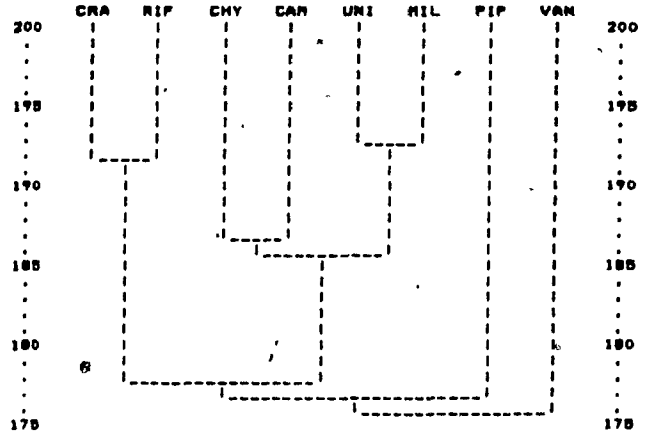


Figure 61: Dendrogram for Rim Section Attributes
Interior Rim Profile (Format 1)

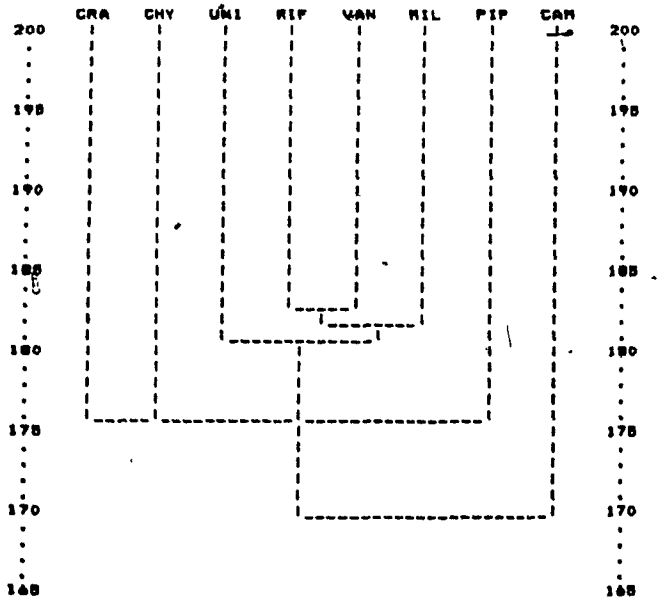


Figure 62: Dendrogram for Rim Section Attributes Angle of Lip to Interior (Format 1)

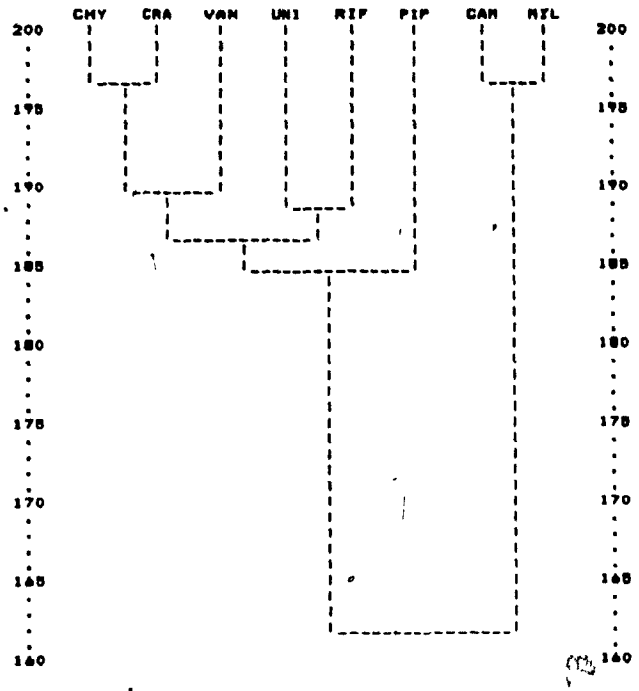


Figure 63: Dendrogram for Rim Section Attributes Collar Base Shape (Format 1)

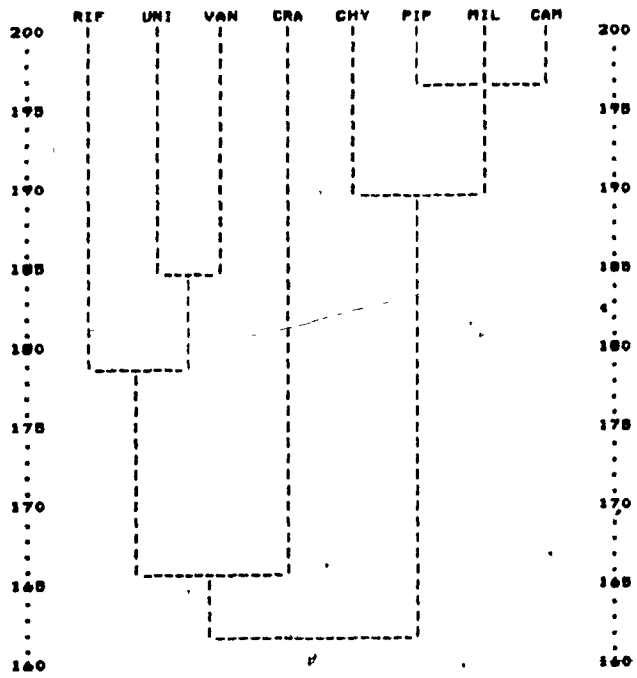


Figure 64: Dendrogram for Rim Section Attributes
Collar Height (Format 1)

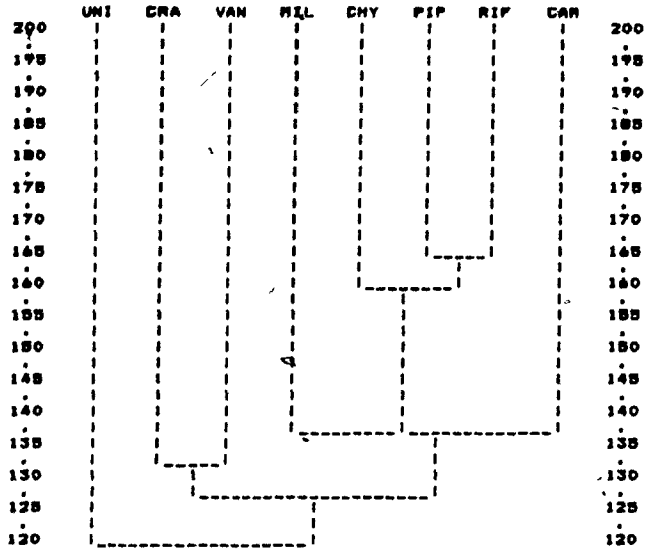


Figure 65: Dendrogram for Rim Section Attributes
Lip Thickness (Format 1)

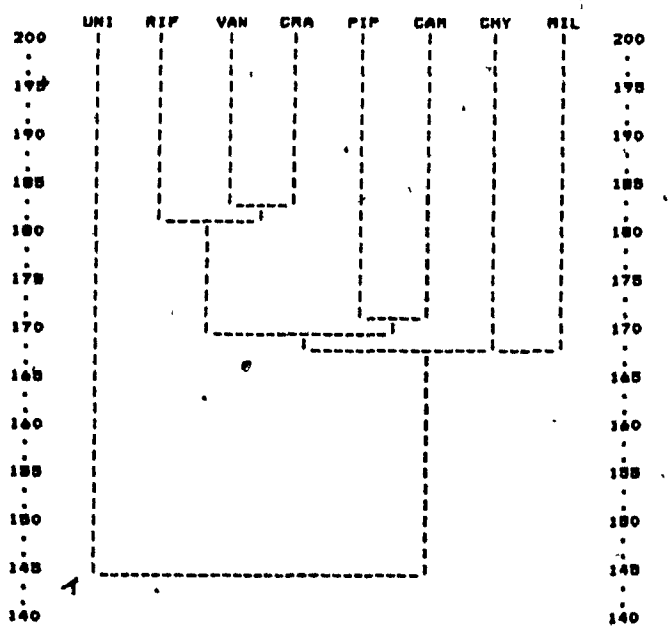


Figure 66: Dendrogram for Rim Section Attributes Collar Base Thickness (Format 1)

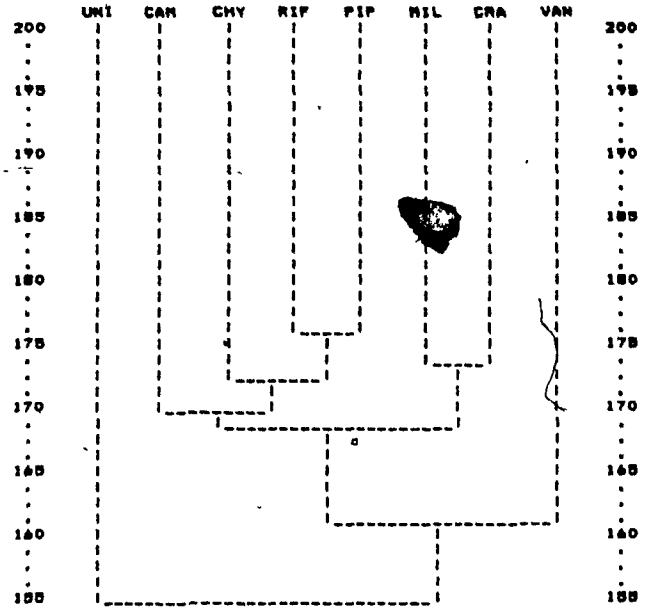


Figure 67: Dendrogram for Rim Section Attributes Rim Diameter at Lip (Format 1):

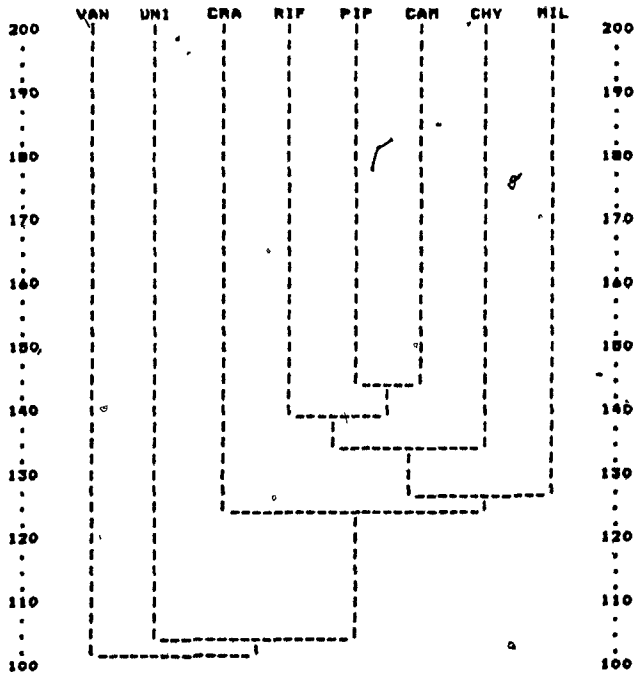


Figure 68: Dendrogram for Rim Section Attributes
Interior Rim Element (Format 1)

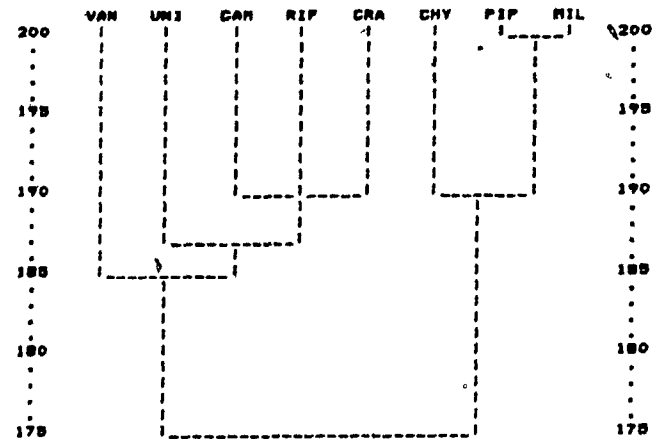


Figure 69: Dendrogram for Rim Section Attributes
Interior Rim Motif (Format 1)

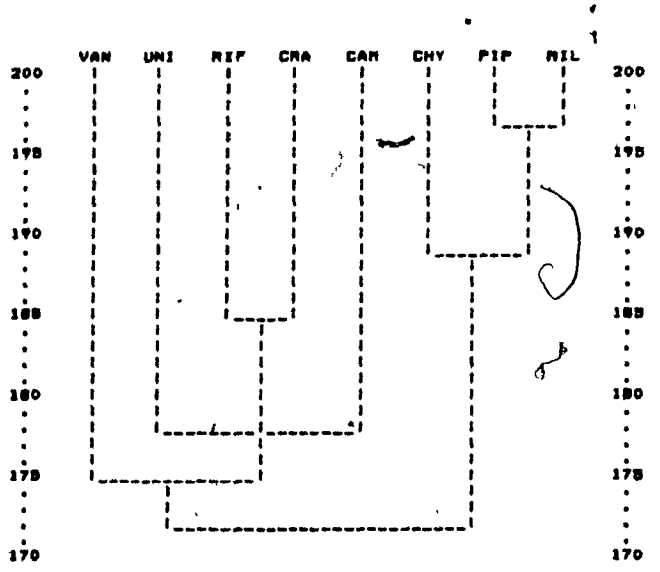


Figure 70: Dendrogram for Rim Section Attributes Lip Element (Format 1)

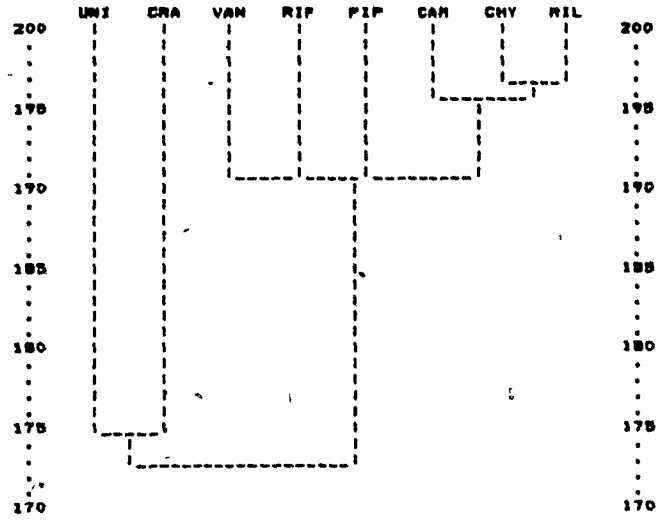


Figure 71: Dendrogram for Rim Section Attributes Lip Motif (Format 1)

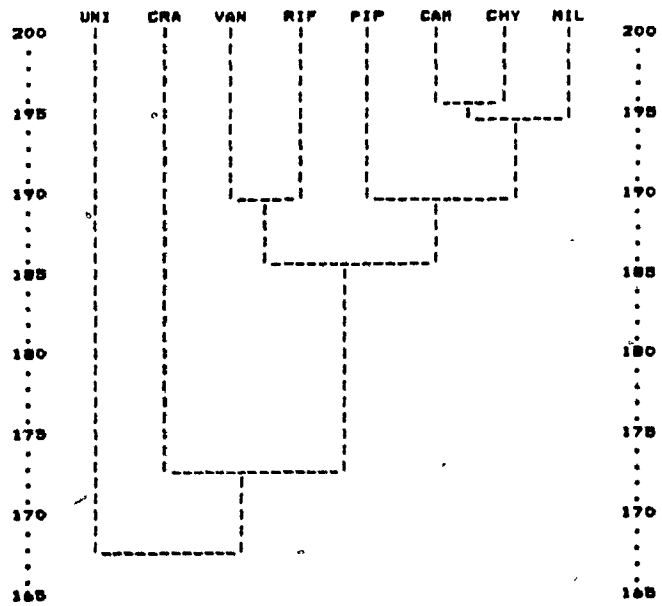


Figure 72: Dendrogram for Rim Section Attributes
Upper Rim Element (Format 1)

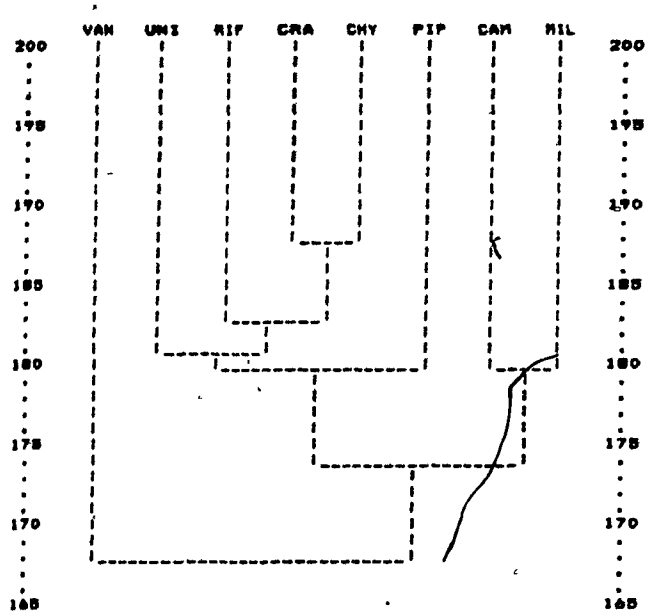


Figure 73: Dendrogram for Rim Section Attributes
Upper Rim Motif (Format 1)

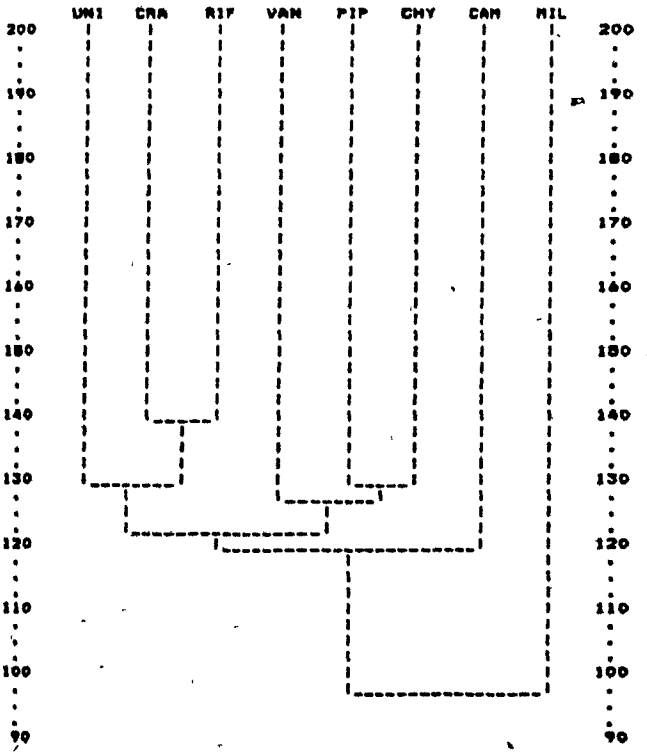


Figure 74: Dendrogram for Rim Section Attributes
Secondary Rim Decoration (Format 1)

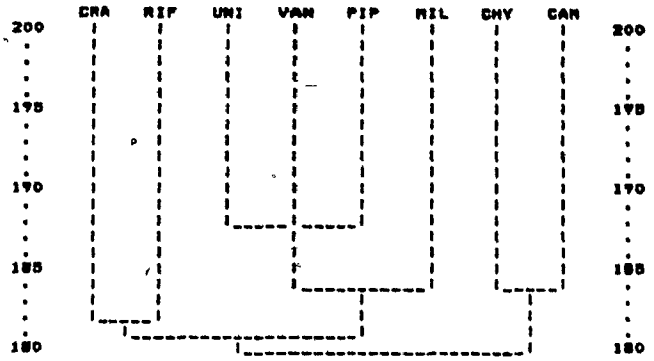


Figure 75: Dendrogram for Rim Section Attributes
Neck Element (Format 1)

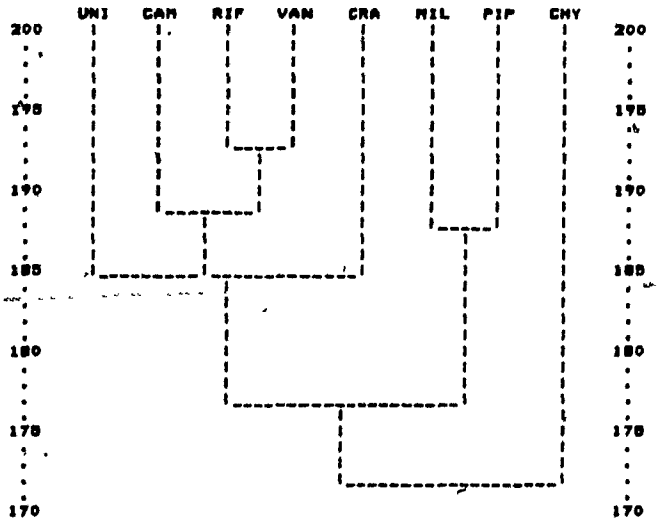


Figure 76: Dendrogram for Rim Section Attributes
Neck Motif (Format 1)

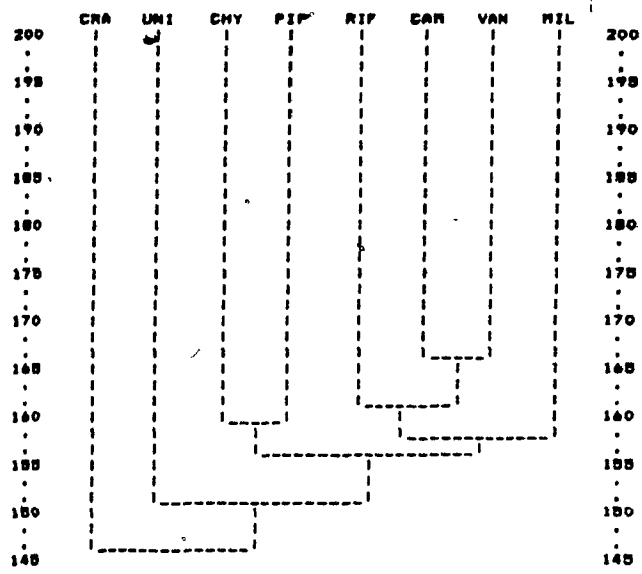


Figure 77: Dendrogram for Rim Section Attributes
Secondary Neck Decoration (Format 1)

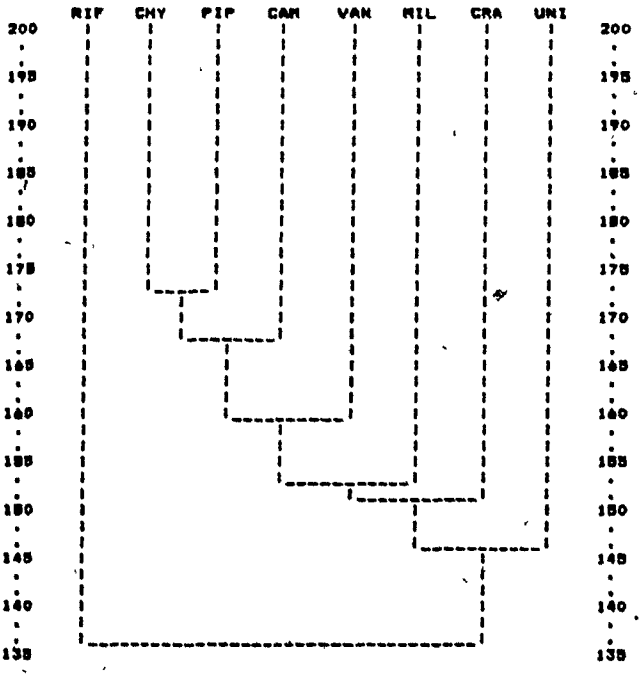


Figure 78: Dendrogram for Rim Section Attributes
Exterior Rim Profile (Format 2)

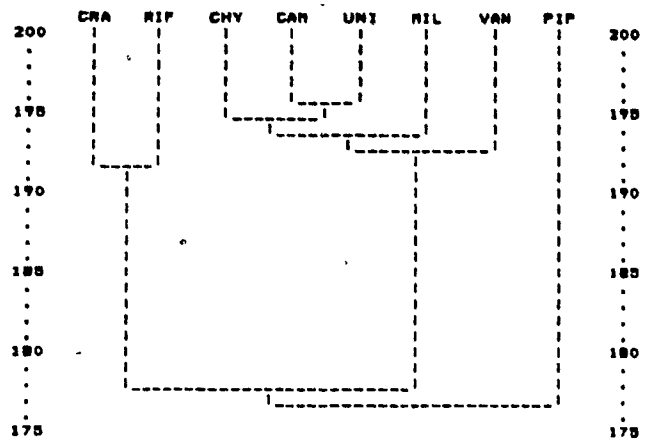


Figure 79: Dendrogram for Rim Section Attributes
Interior Rim Profile (Format 2)

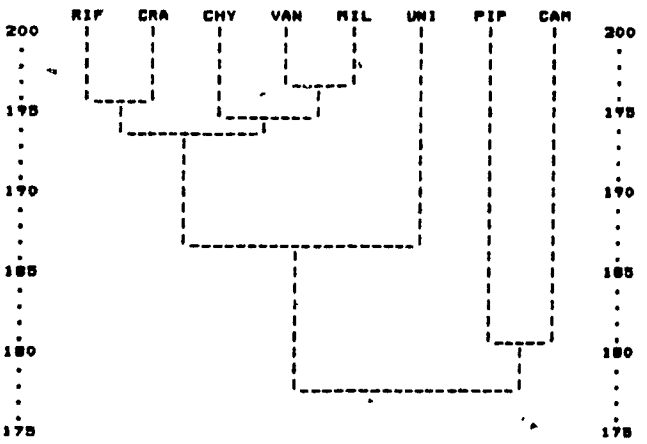


Figure 80: Dendrogram for Rim Section Attributes
Collar Height (Format 2)

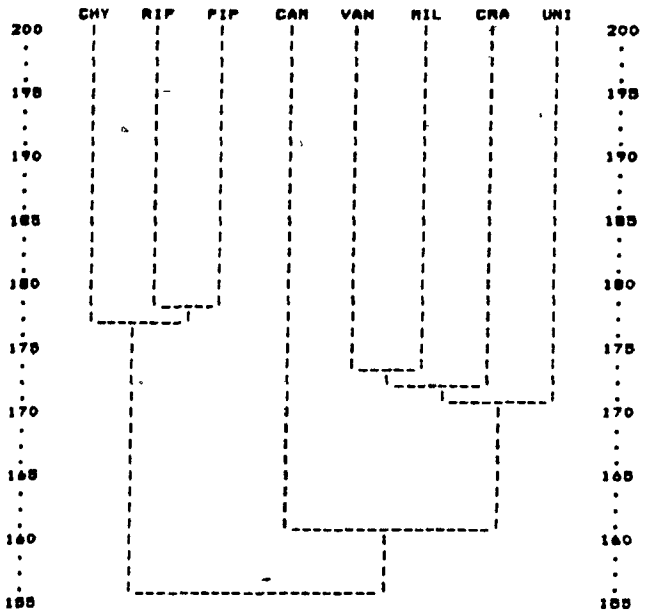


Figure 81: Dendrogram for Rim Section Attributes
Lip Thickness (Format 2)

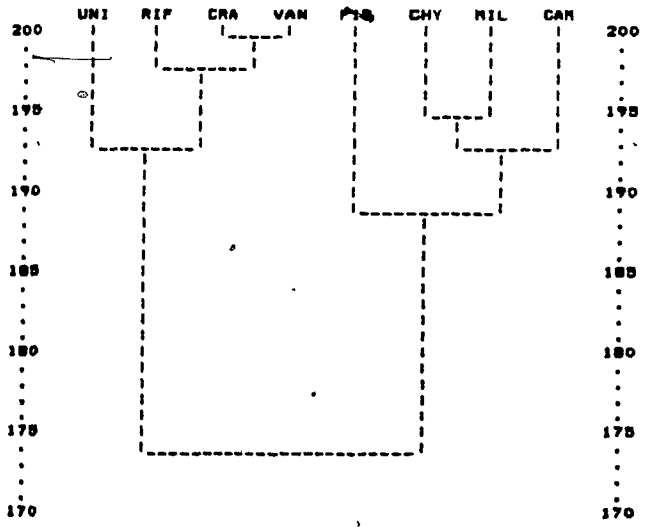


Figure 82: Dendrogram for Rim Section Attributes
Collar Width at Base (Format 2)

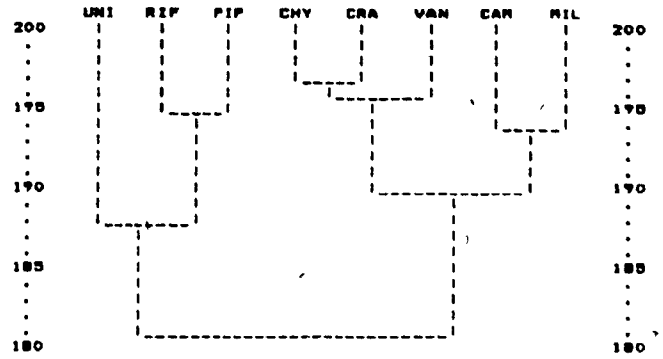


Figure 83: Dendrogram for Rim Section Attributes
Rim Diameter at Lip (Format 2)

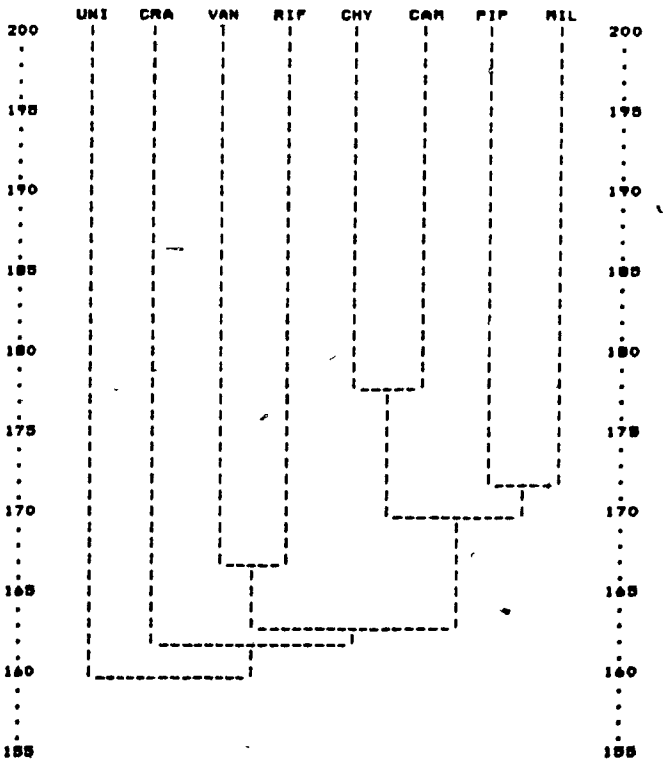


Figure 84: Dendrogram for Rim Section Attributes
Interior Rim Element (Format 2)

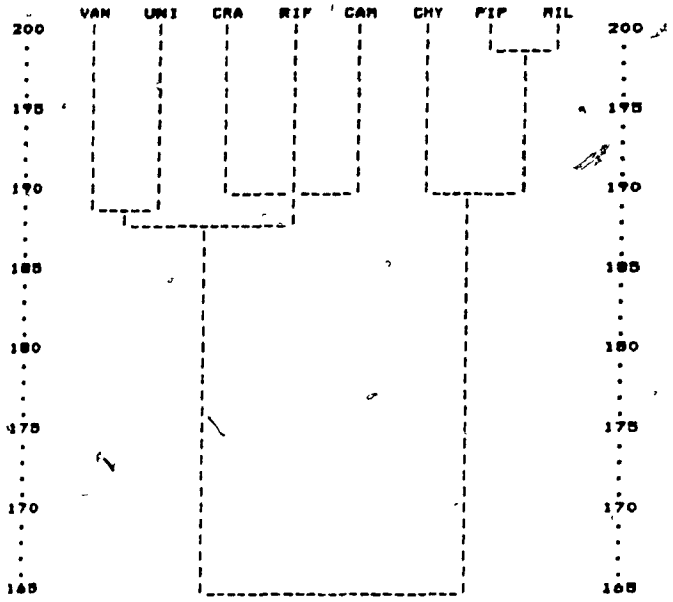


Figure 85: Dendrogram for Rim Section Attributes
Interior Rim Motif (Format 2)

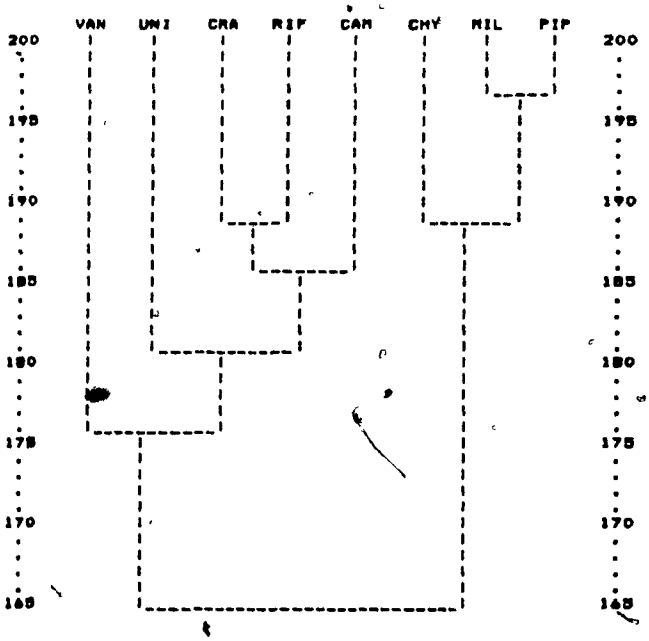


Figure 86: Dendrogram for Rim Section Attributes Lip Element (Format 2)

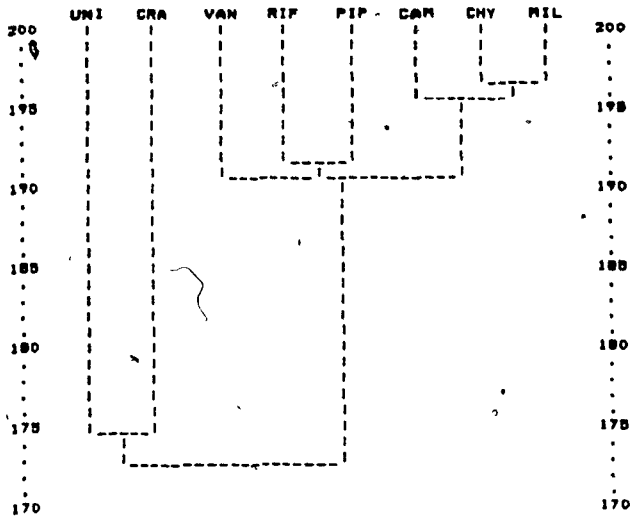


Figure 87: Dendrogram for Rim Section Attributes Lip Motif (Format 2)

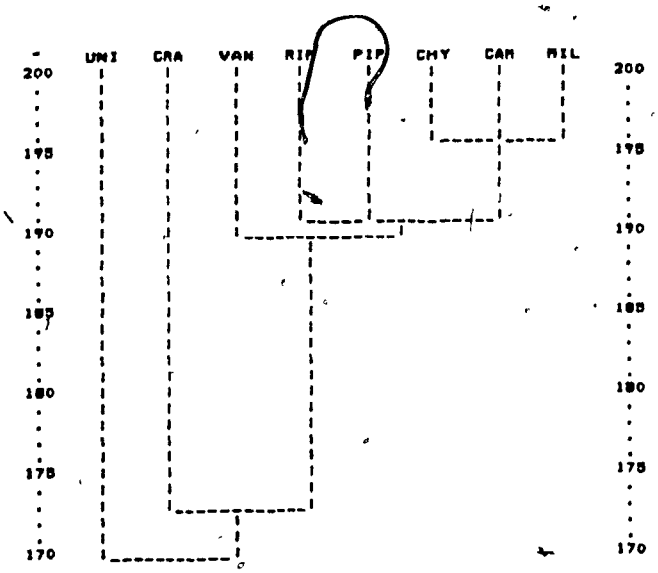


Figure 88: Dendrogram for Rim Section Attributes
Upper Rim Element (Format)

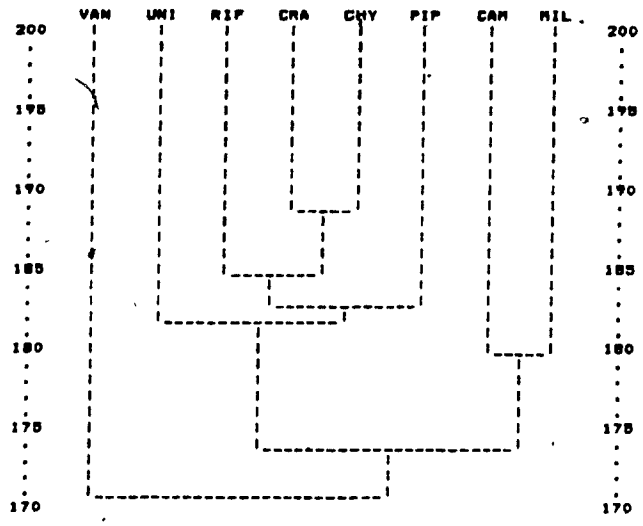


Figure 89: Dendrogram for Rim Section Attributes
Upper Rim Motif (Format 2)

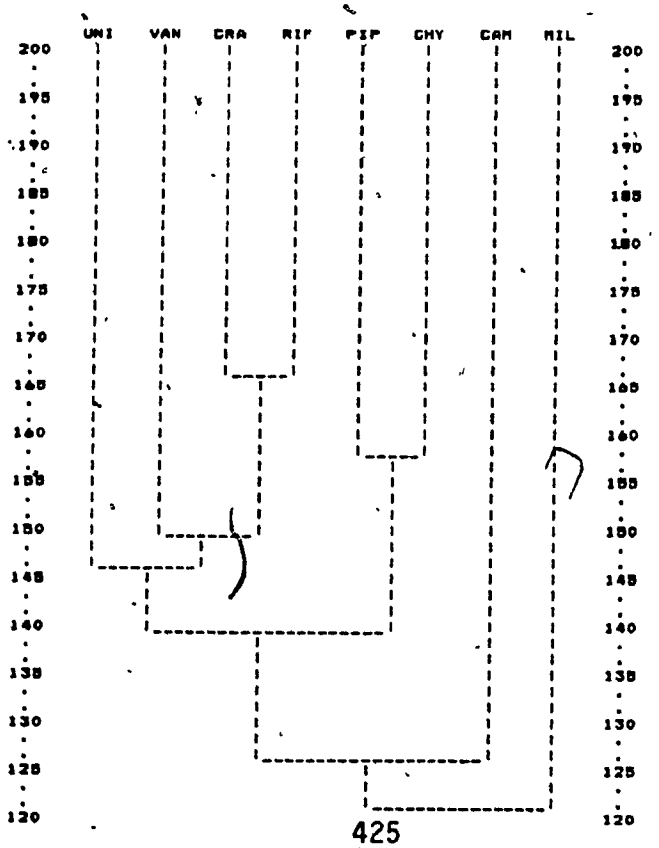


Figure 90: Dendrogram for Rim Section Attributes
Secondary Rim Decoration (Format 2)

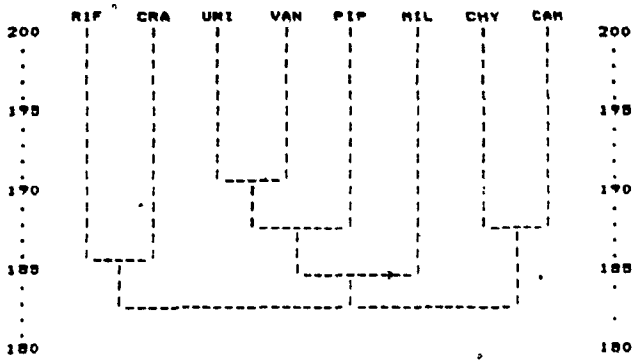


Figure 91: Dendrogram for Rim Section Attributes
Neck Element (Format 2)

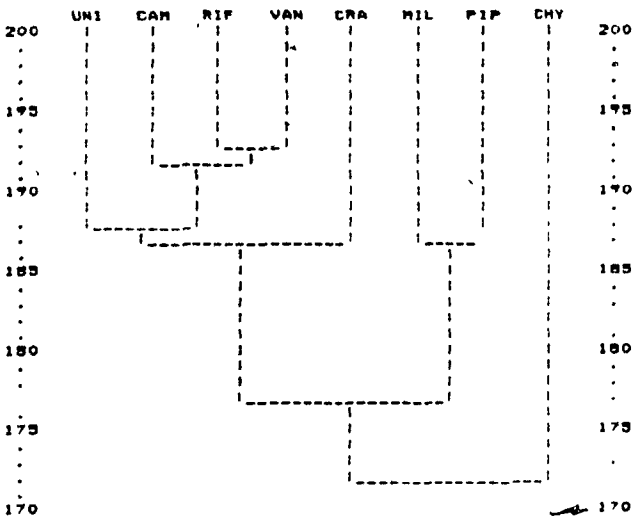


Figure 92: Dendrogram for Rim Section Attributes Neck Motif (Format 2)

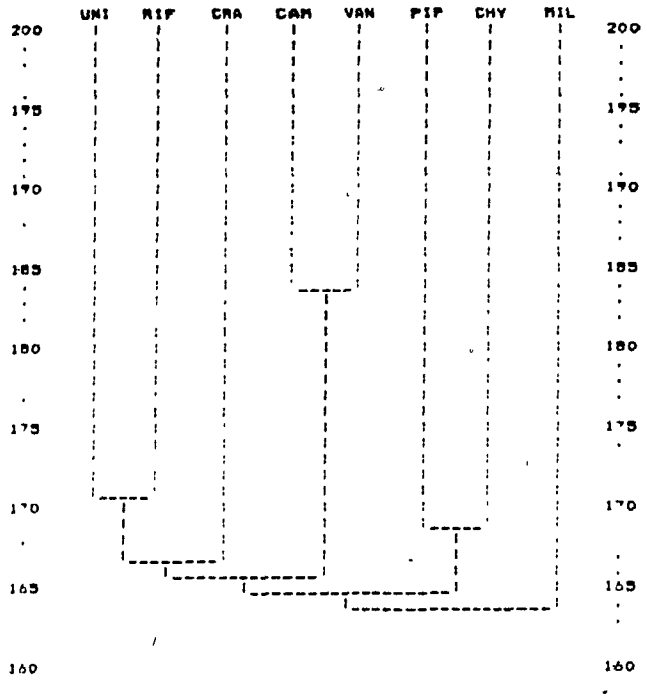


Figure 93: Dendrogram for Rim Section Attributes Secondary Neck Decoration (Format 2)

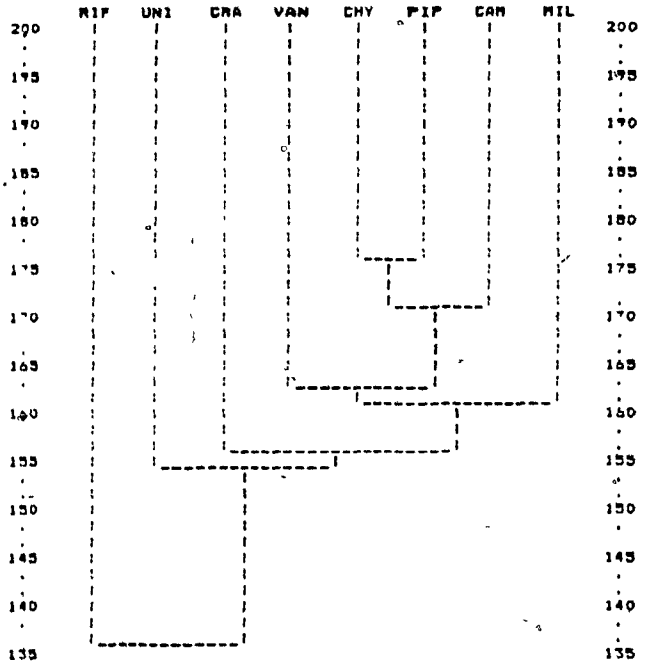


Figure 94: Dendrogram for Rim Section Attributes
Interior Rim Motif (Format 3)

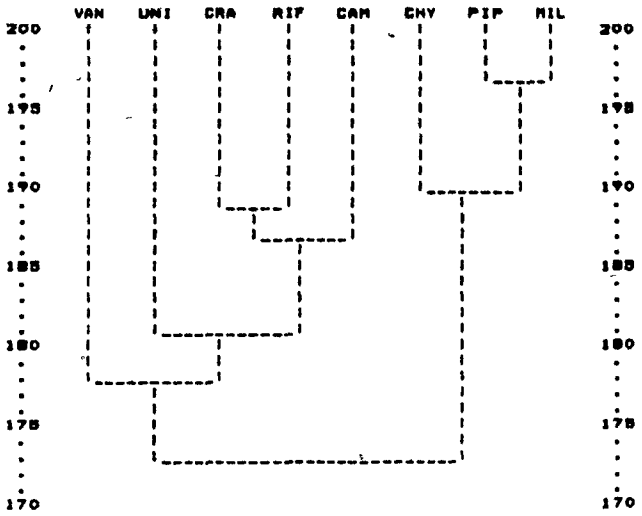


Figure 95: Dendrogram for Rim Section Attributes.
Lip Motif (Format 3)

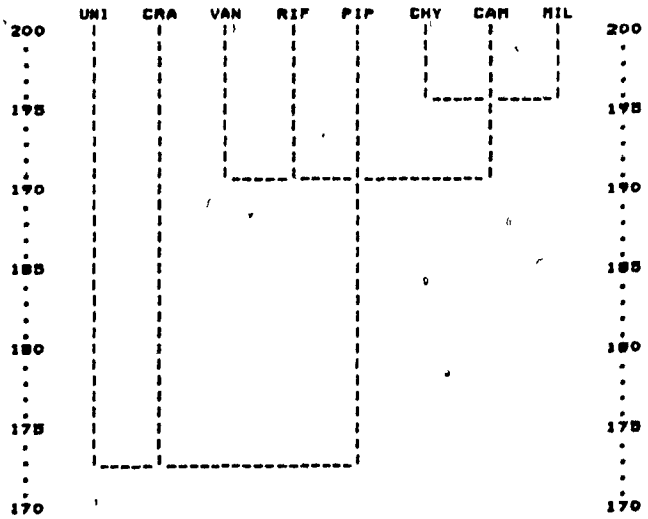


Figure 96: Dendrogram for Rim Section Attributes
Upper Rim Motif (Format 3)

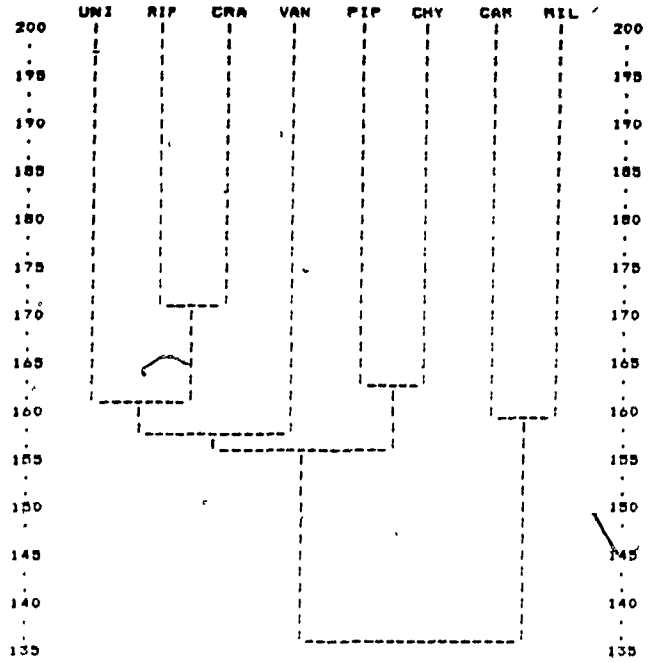


Figure 97: Dendrogram for Rim Section Attributes
Secondary Rim Decoration (Format 3)

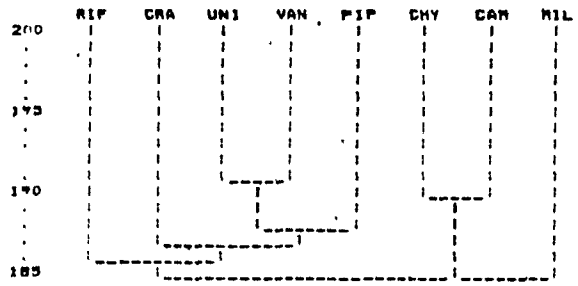


Figure 98: Dendrogram for Rim Section Attributes Neck Motif (Format 3)

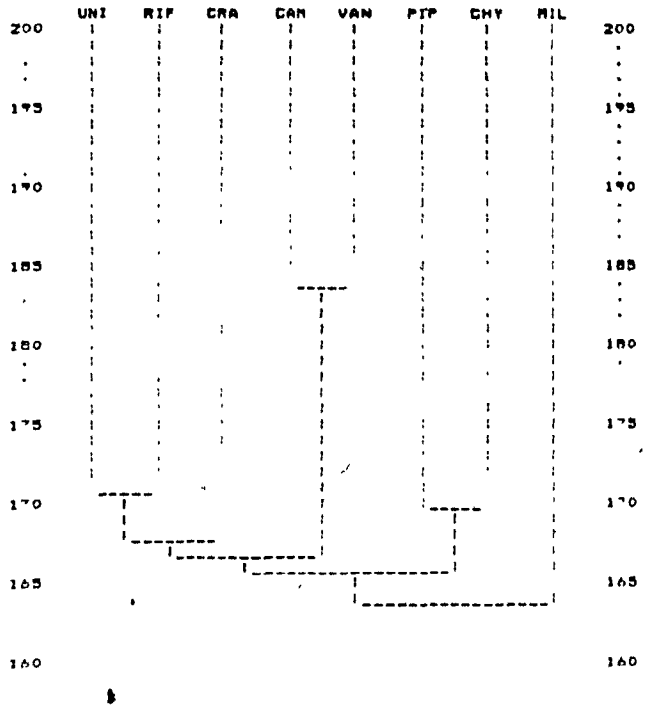


Figure 99: Dendrogram for Rim Section Attributes Secondary Neck Decoration (Format 3)

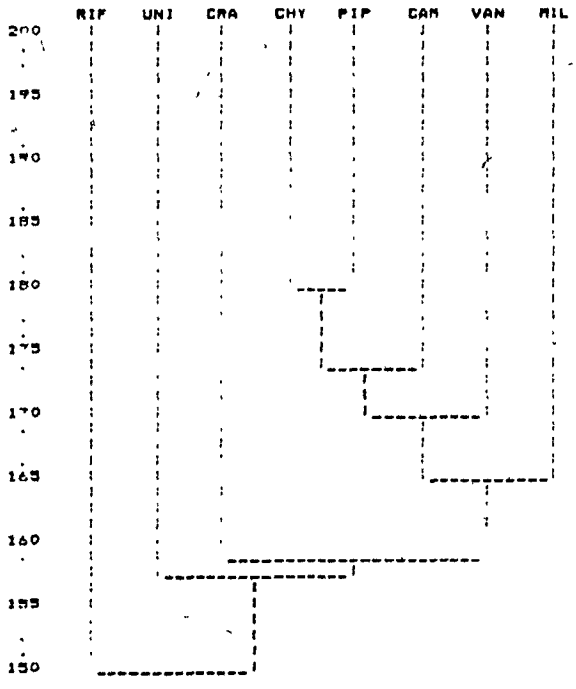


Figure 100: Dendrogram for Rim Section Attributes
Interior Rim Motif (Format 4)

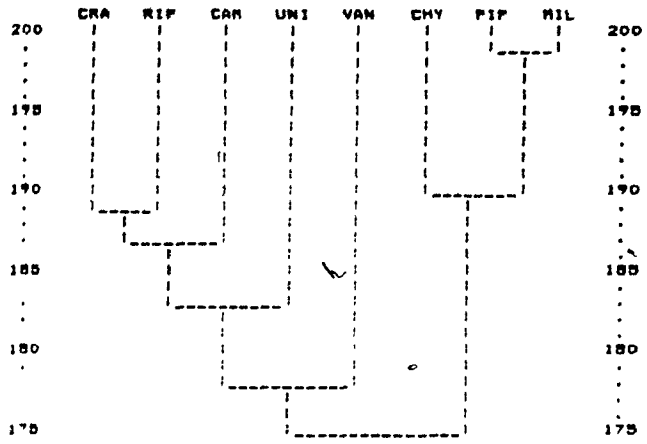


Figure 101: Dendrogram for Rim Section Attributes
Lip Motif (Format 4)

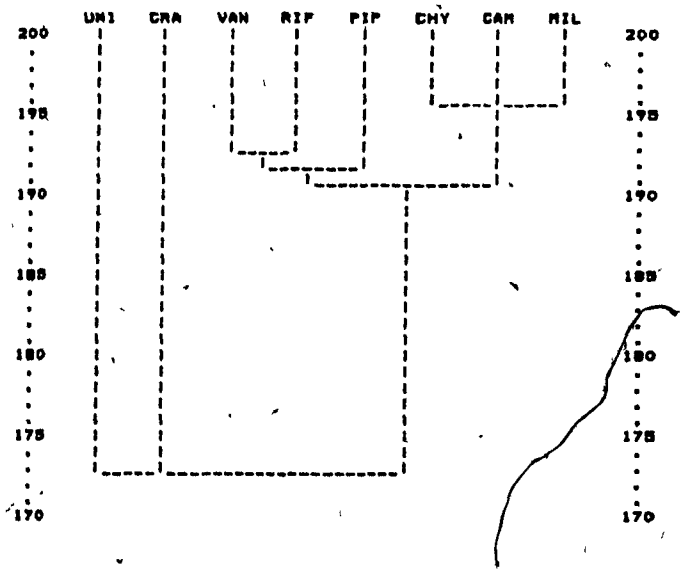


Figure 102: Dendrogram for Rim Section Attributes
Upper Rim Motif (Format 4)

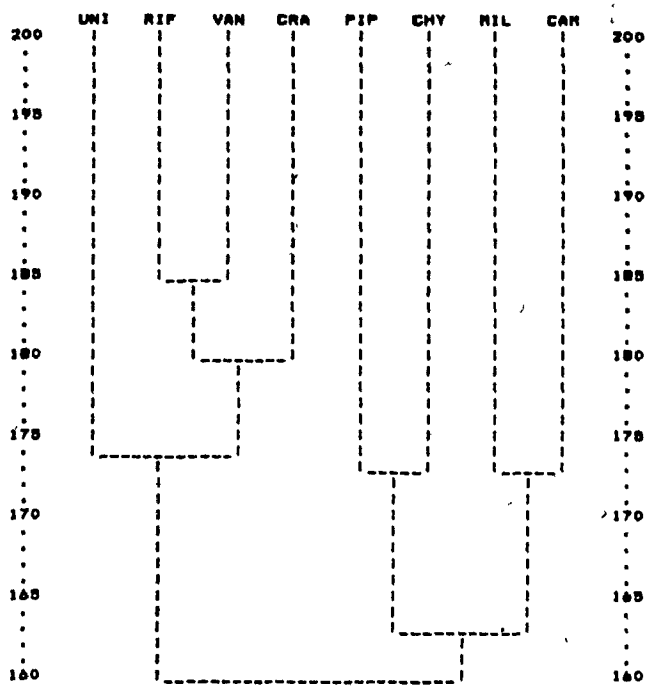


Figure 103: Dendrogram for Rim Section Attributes
Secondary Rim Decoration (Format 4)

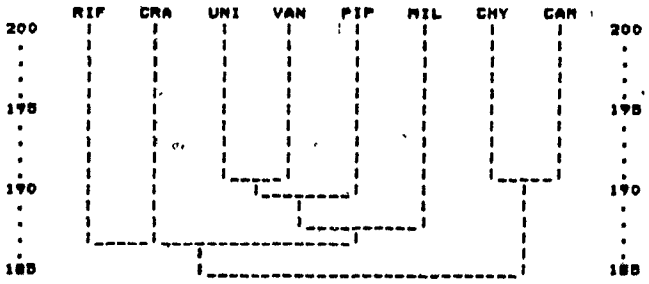


Figure 104: Dendrogram for Rim Section Attributes
Neck Motif (Format 4)

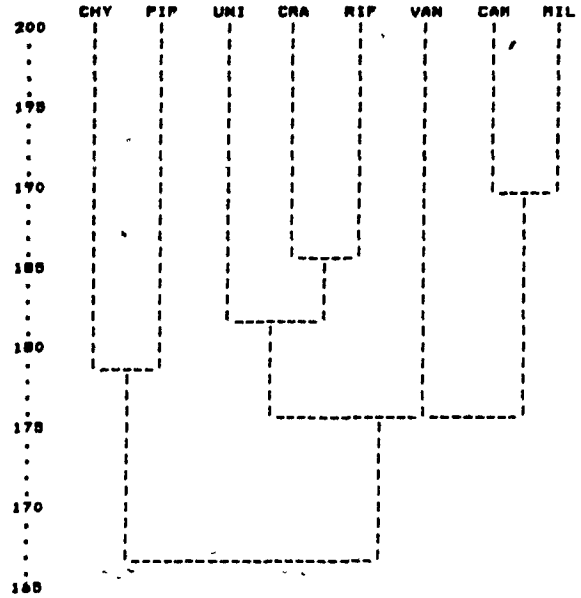


Figure 105: Dendrogram for Rim Section Attributes
Secondary Neck Decoration (Format 4)

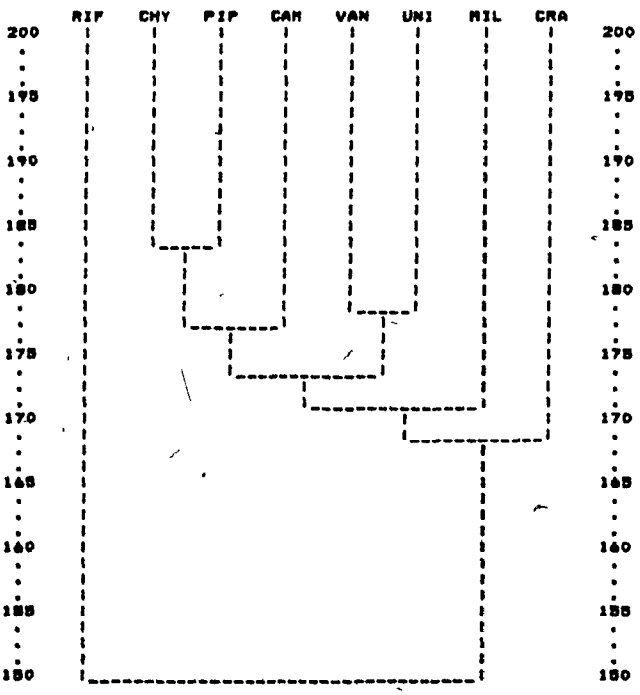


Figure 106: Dendrogram for Rim Section Attributes Interior Rim Motif (Format 5)

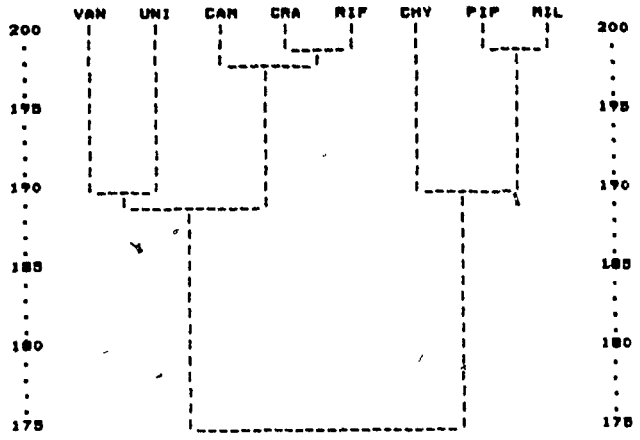


Figure 107: Dendrogram for Rim Section Attributes Lip Motif (Format 5)

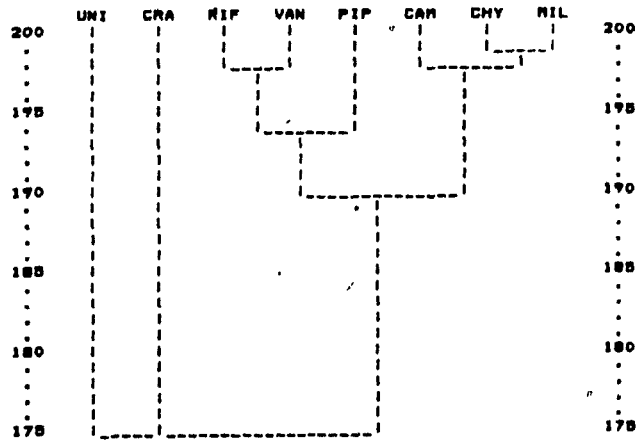


Figure 108: Dendrogram for Rim Section Attributes
Upper Rim Motif (Format 5)

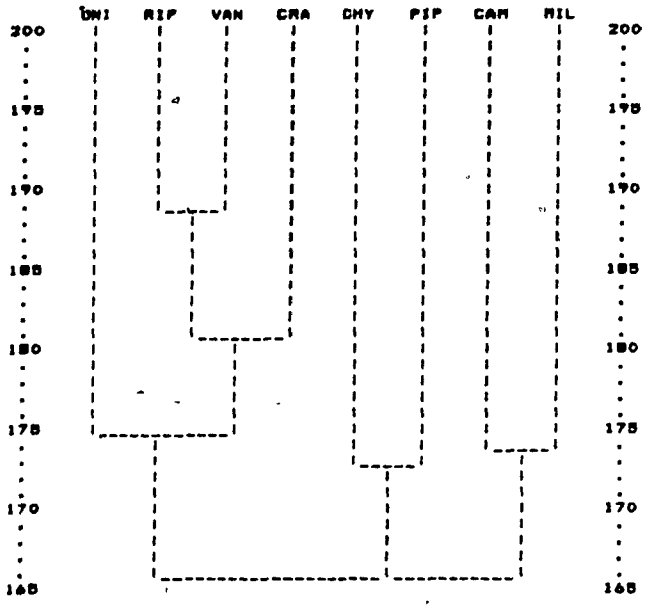


Figure 109: Dendrogram for Rim Section Attributes
Secondary Rim Decoration (Format 5)

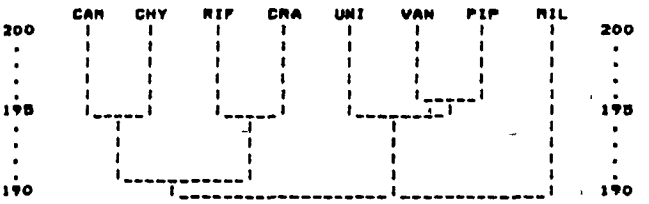


Figure 110: Dendrogram for Rim Section Attributes
Neck Motif (Format 5)

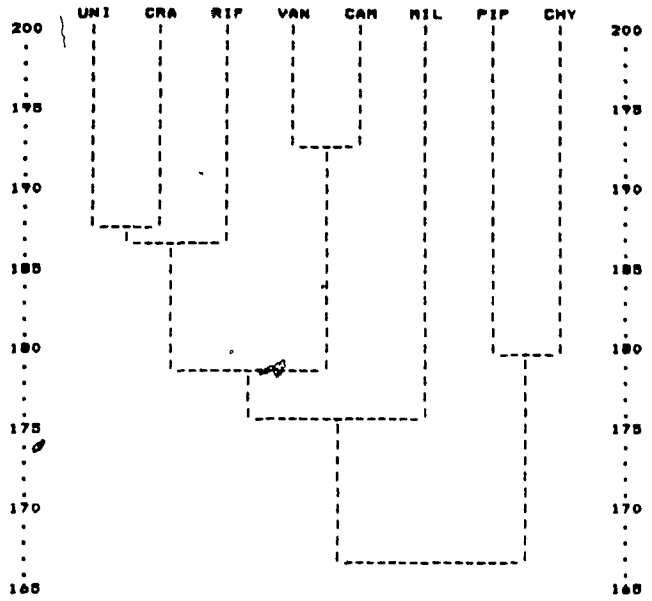


Figure 111: Dendrogram for Rim Section Attributes
Secondary Neck Decoration (Format 5)

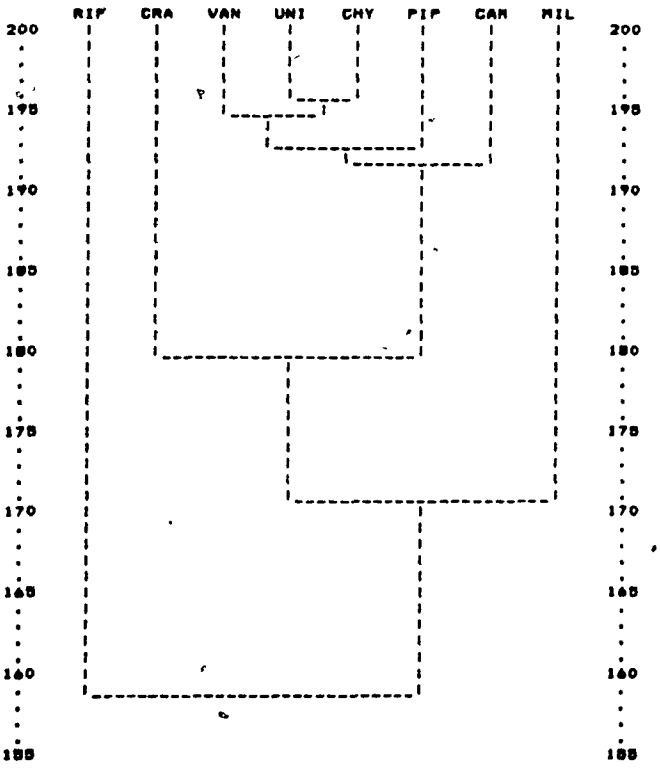


Figure 112: Dendrogram for Rim Section Attributes
Secondary Rim Decoration (Format 6)

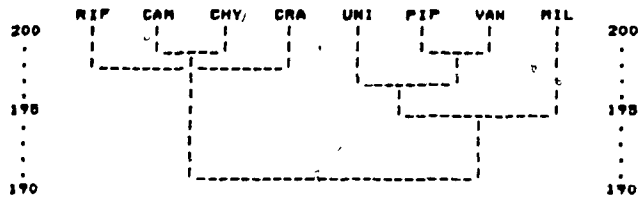


Figure 113: Dendrogram for Rim Section Attributes
Neck Motif (Format 6)

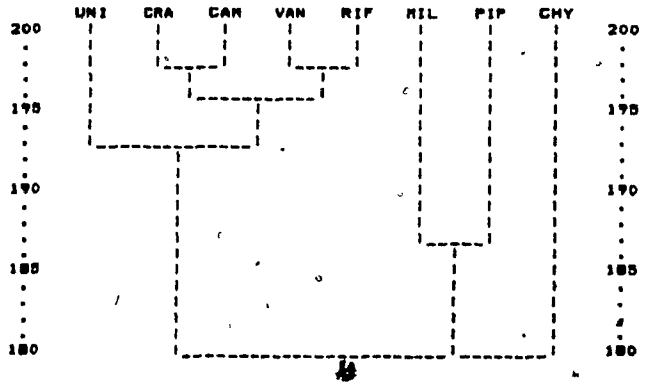


Figure 114: Dendrogram for Rim Section Attributes
Secondary Neck Decoration (Format 6)

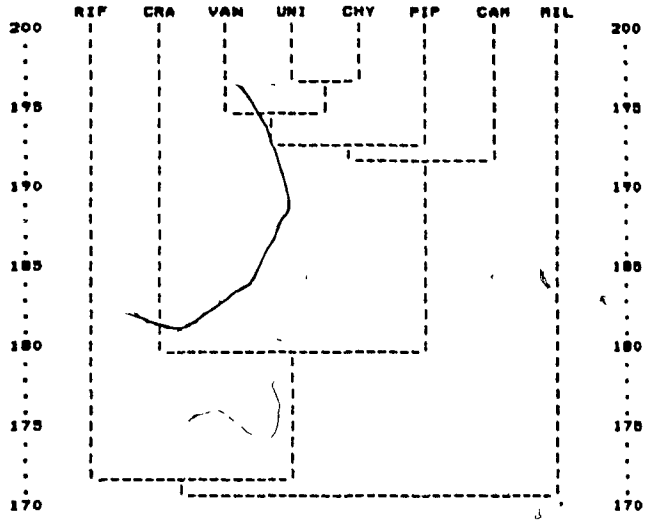


Figure 115: Dendrogram for Pipe Bowl Section Attributes
Exterior Bowl Orientation (Format 1)

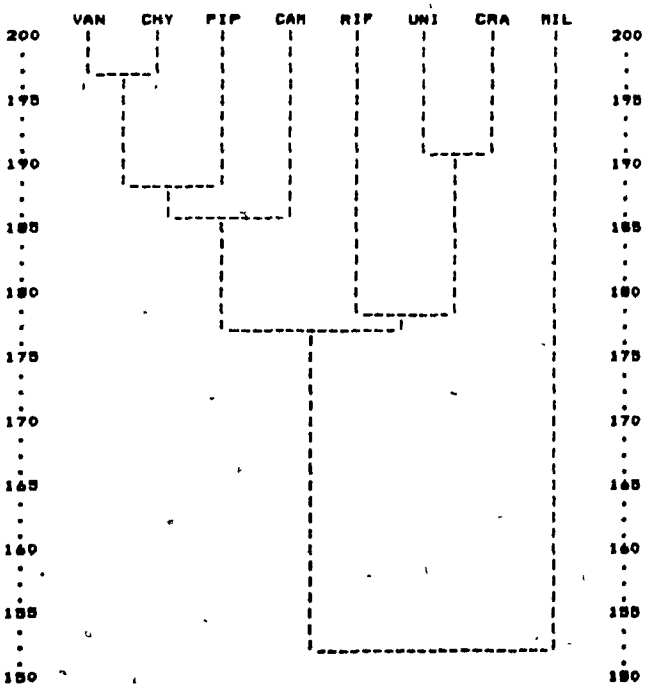


Figure 116: Dendrogram for Pipe Bowl Section Attributes
Exterior Bowl Profile (Format 1)

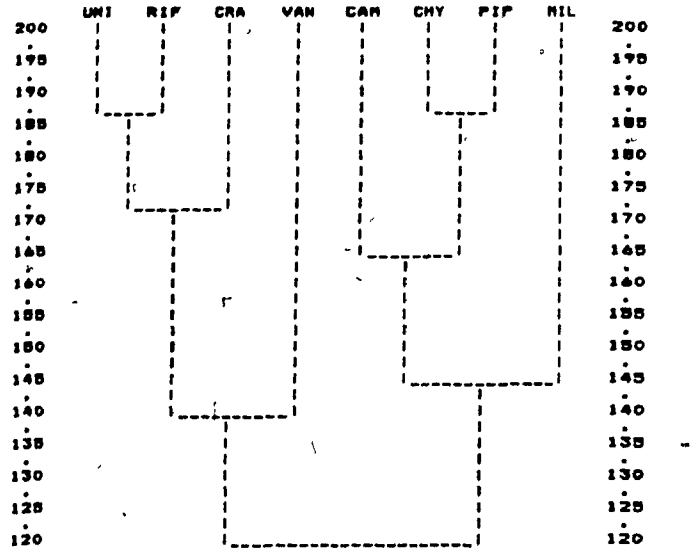


Figure 117: Dendrogram for Pipe Bowl Section Attributes
Interior Bowl Profile (Format 1)

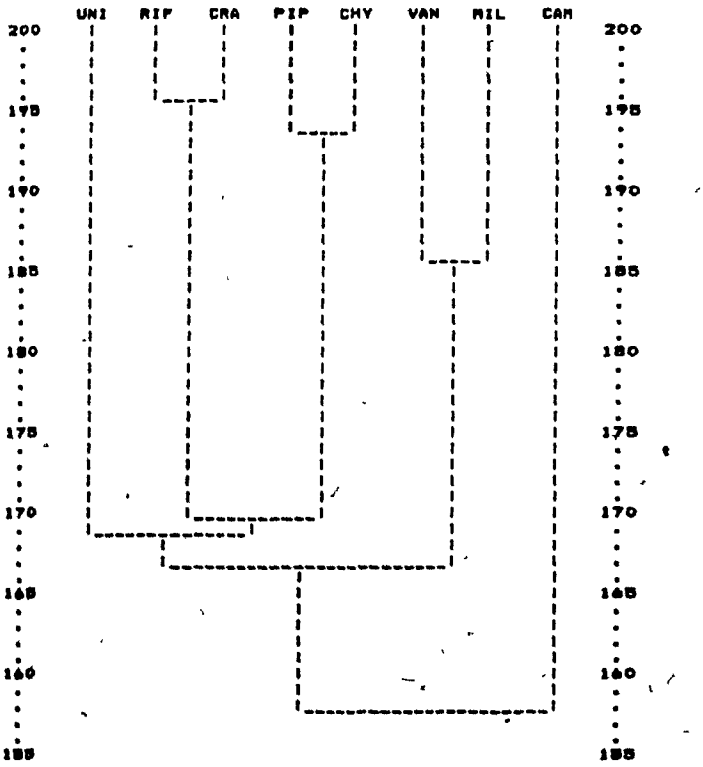


Figure 118: Dendrogram for Pipe Bowl Section Attributes
Angle of Lip to Interior (Format 1)

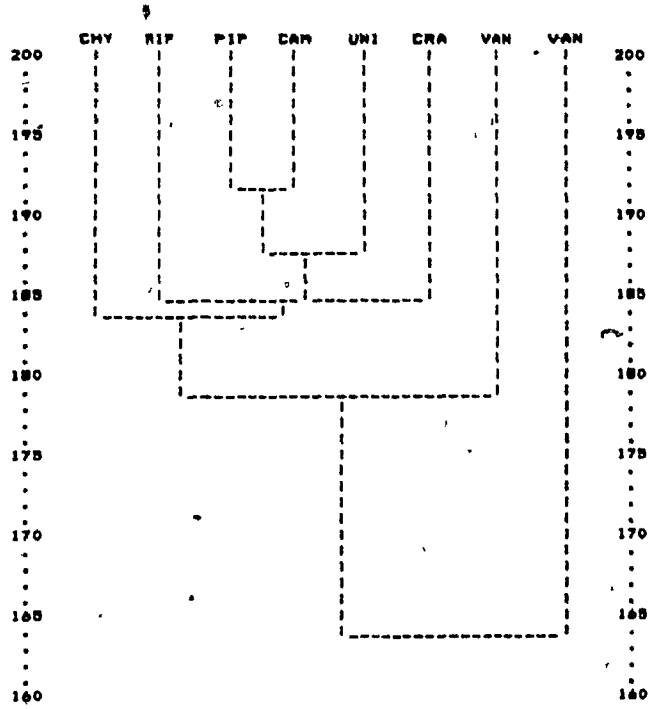


Figure 119: Dendrogram for Pipe Bowl Section Attributes
Lip Thickness (Format 1)

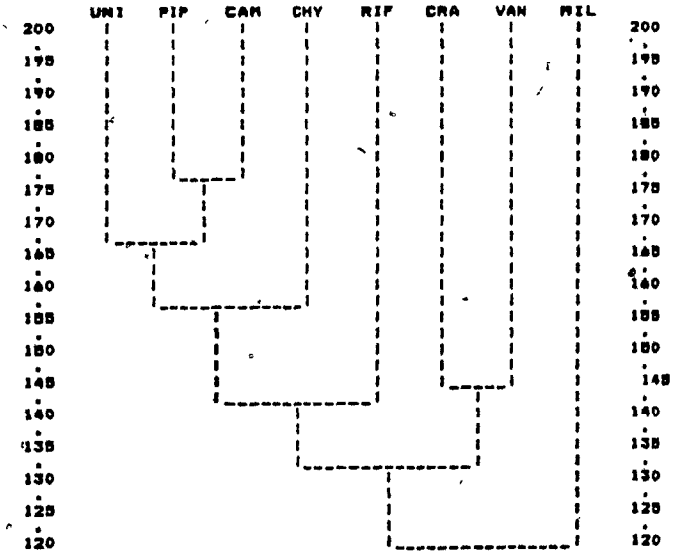


Figure 120: Dendrogram for Pipe Bowl Section Attributes Bowl Decorative Element (Format 1)

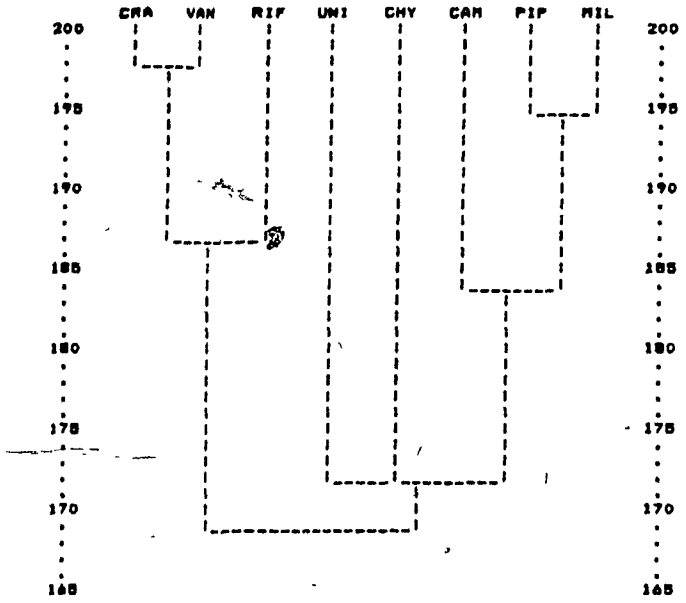


Figure 121: Dendrogram for Pipe Bowl Section Attributes Bowl Decorative Motif (Format 1)

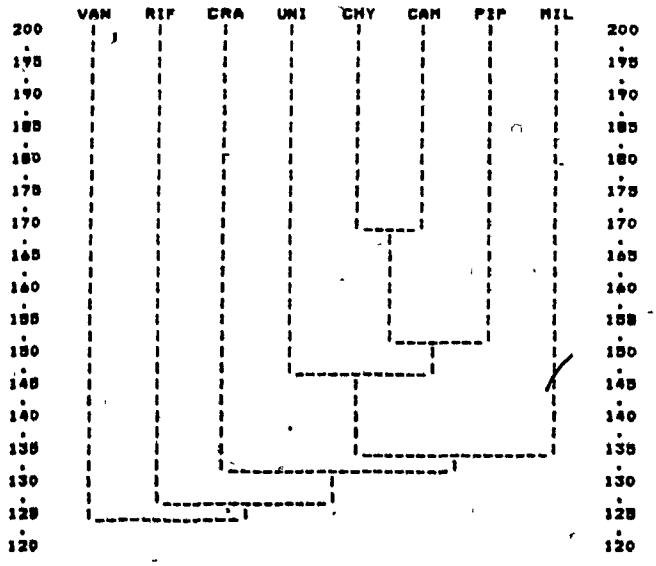


Figure 122: Dendrogram for Pipe Bowl Section Attributes Secondary Bowl Decoration (Format 1)

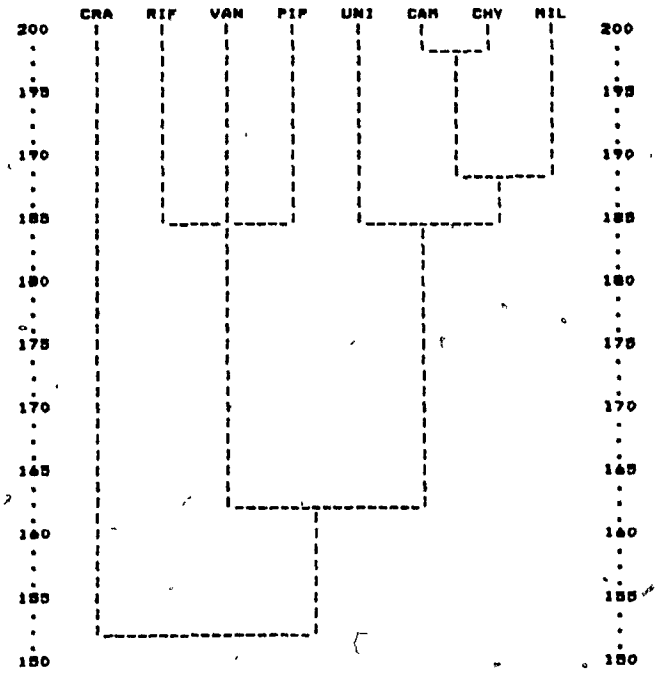


Figure 123: Dendrogram for Pipe Bowl Section Attributes Exterior Bowl Profile (Format 2)

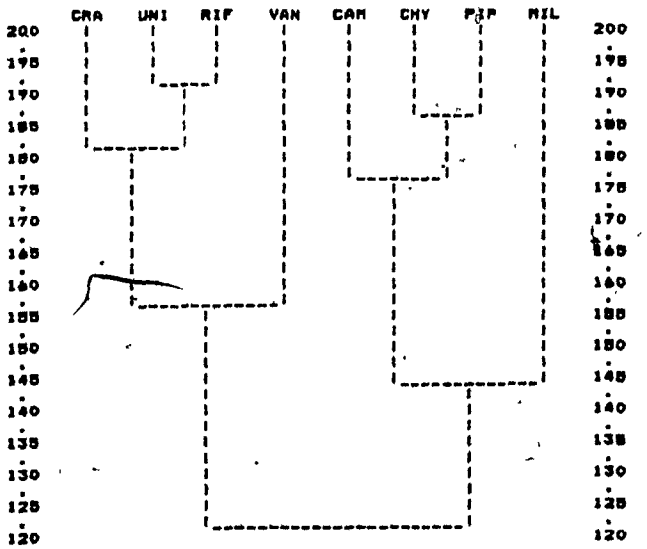


Figure 124: Dendrogram for Pipe Bowl Section Attributes
Interior Bowl Profile (Format 2)

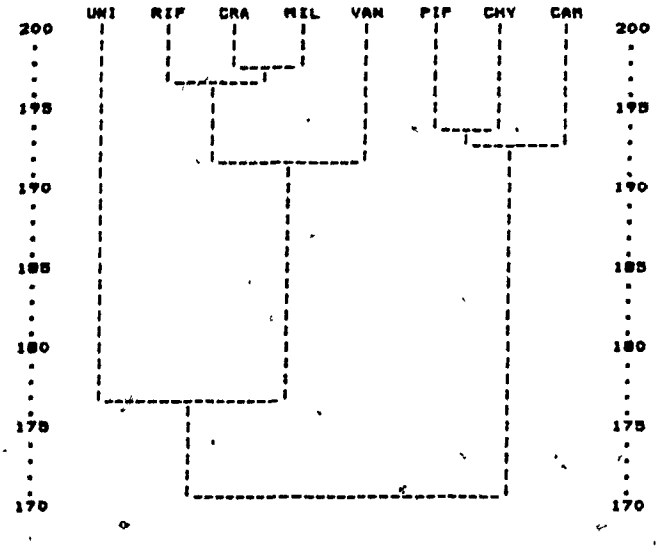


Figure 125: Dendrogram for Pipe Bowl Section Attributes
Bowl Lip Thickness (Format 2)

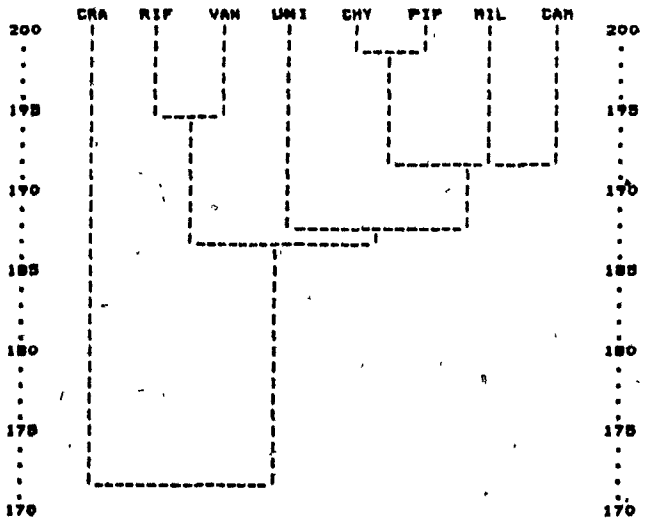


Figure 126: Dendrogram for Pipe Bowl Section Attributes Bowl Motif (Format 2)

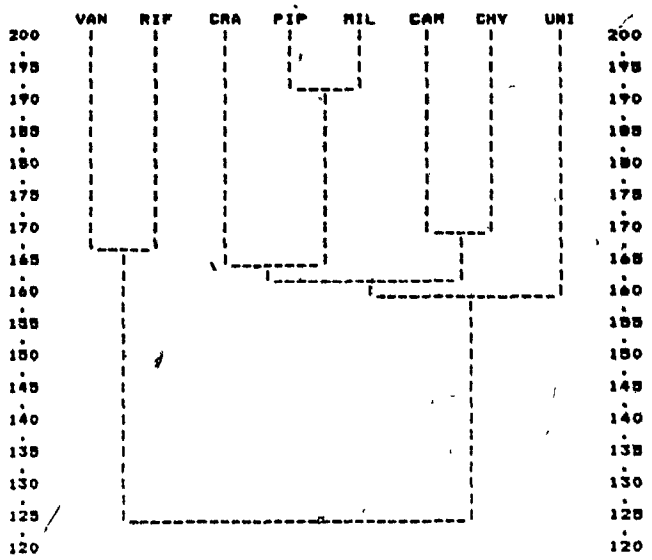


Figure 127: Dendrogram for Pipe Bowl Section Attributes Secondary Bowl Motif (Format 2)

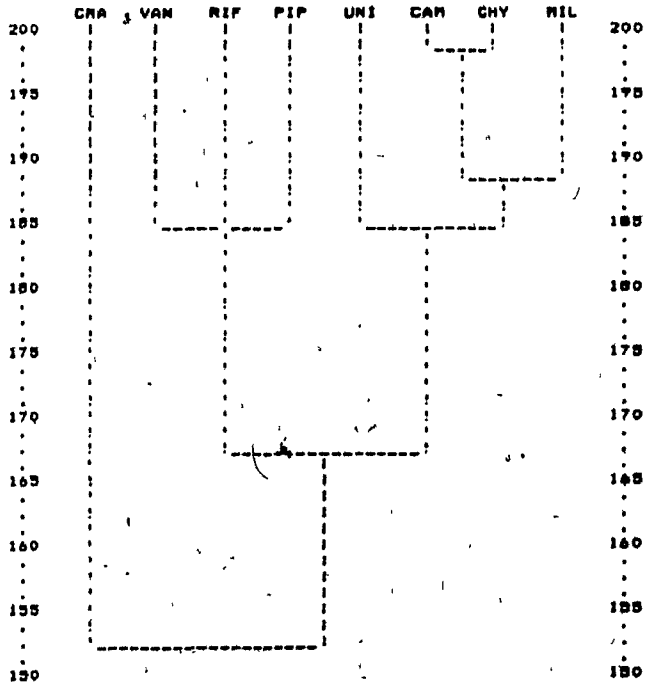


Figure 128: Dendrogram for Pipe Bowl Section Attributes Bowl Motif (Format 3)

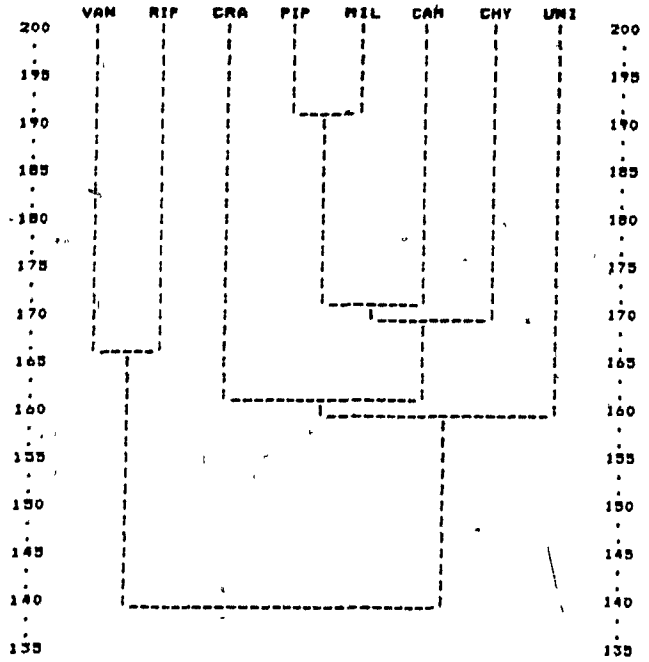


Figure 129: Dendrogram for Pipe Bowl Section Attributes Secondary Bowl Decoration (Format 3)

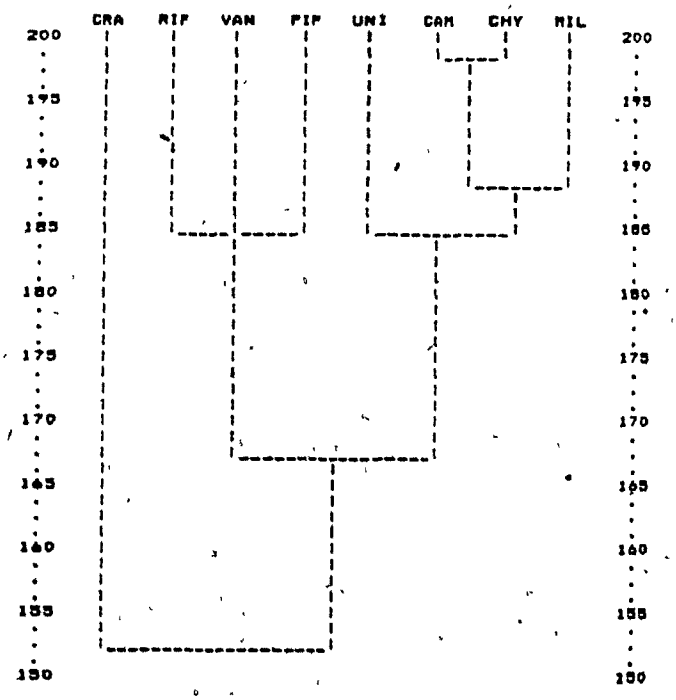


Figure 130: Dendrogram for Pipe Bowl Section Attributes
Bowl Motif (Format 4)

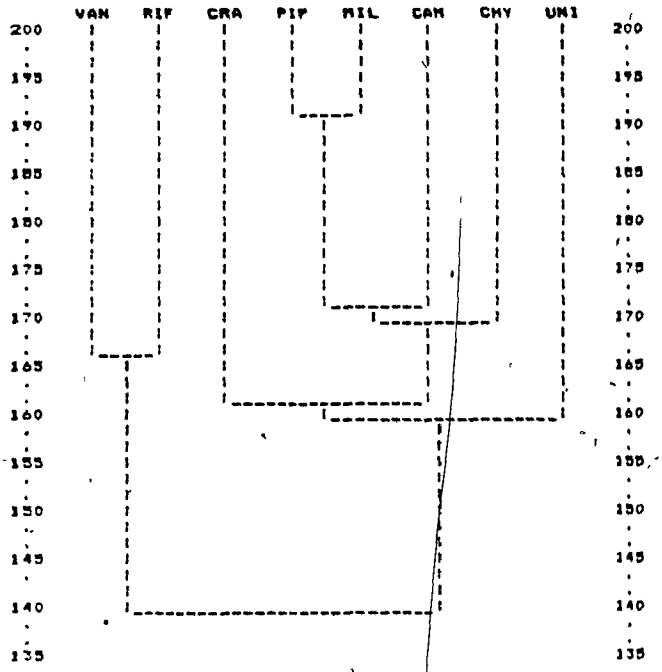


Figure 131: Dendrogram for Pipe Bowl Section Attributes
Secondary Bowl Decoration (Format 4)

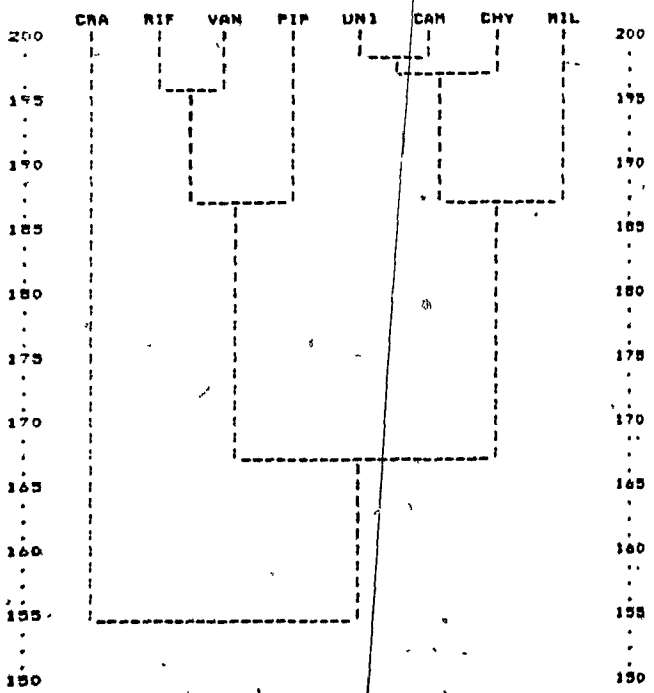


Figure 132: Dendrogram for Pipe Bowl Section Attributes Bowl Motif (Format 5)

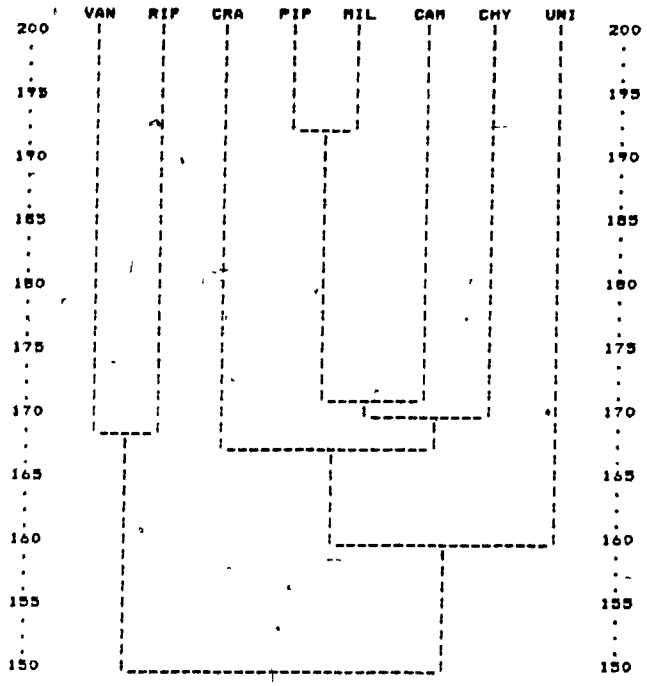


Figure 133: Dendrogram for Pipe Bowl Section Attributes Secondary Bowl Decoration (Format 5)

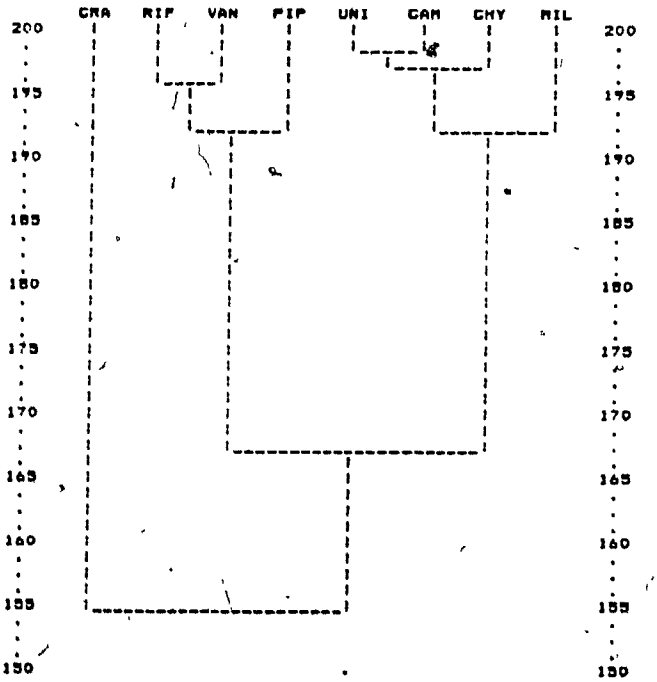


Figure 134: Dendrogram for Pipe Bowl Section Attributes Bowl Motif (Format 6)

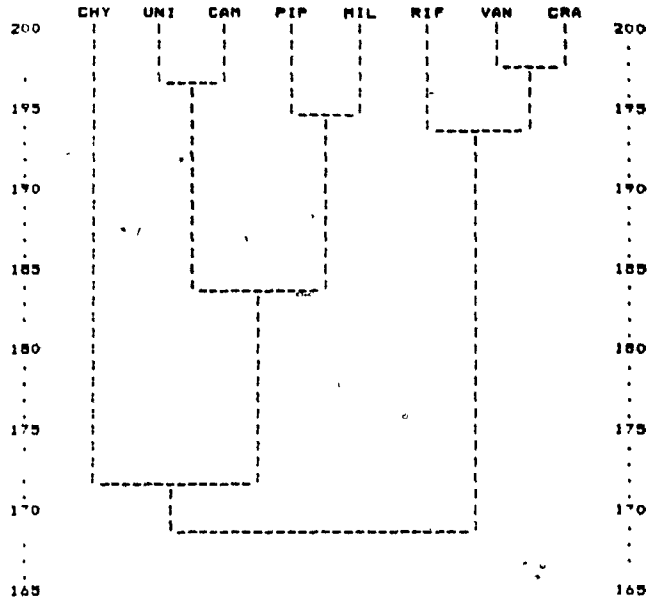
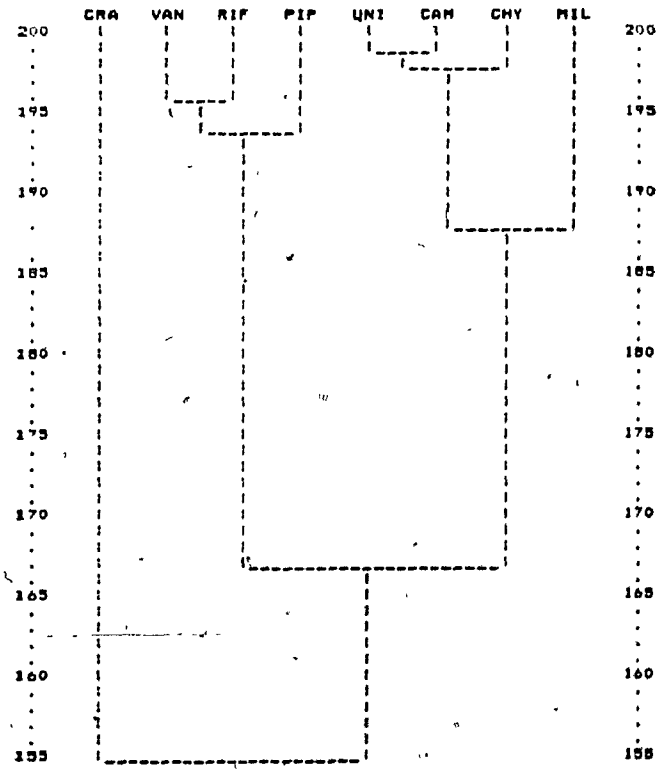


Figure 135: Dendrogram for Pipe Bowl Section Attributes Secondary Bowl Decoration (Format 6)



The next step in increasing complexity of analysis was to consider the pattern of variation that occurred between and among variables (i.e. multivariate analysis). This can be conducted on several levels, of which I chose the simplest: to consider the co-occurrence of values between two variables or among more than two variables. This was done by simply defining new, more complex, variables, the values of which were determined by the permutations of combination of the values of the simpler variables. These values were termed attribute combinations, and their relationships to attributes, attribute variables, and the more complex variables is illustrated in Figure 1 (pg. 81). Because attribute combinations were defined as values of variables, all of the techniques, both statistical and visual, described above could be applied to them.

The rationale for selecting values and variables for attribute combinations will be discussed in general here and in more detail in the substantive sections below. Two approaches to this problem could have been used. The first was to take all of the attribute variables and generate all of the possible permutations of combination of all of their values. This would be an extremely cumbersome task, and fortunately is rendered unnecessary by the nature of the lower level analysis and the objectives of the dissertation. My aim is not to examine all possible patterns of variation in the data base, but to identify the patterns that are most germane to testing analytically the model presented in the previous chapter. The purpose of the lower level analysis was to search for a meaningful or key pattern of variation in the attribute variables. The objective of the higher level analysis was to test and refine this variation because of the nature of higher level analytical entities, assuming that higher level analytical entities might demonstrate a

greater degree of unexpected patterning than lower level entities (Clarke 1978). The variables used for generating attribute combinations were, therefore, those that showed the greatest degree of non-random or key patterns of variability.

In addition to simply generating more complex variables of attribute combinations, an even more complex procedure of testing for degree of association of values can be applied. This form of multivariate analysis has been relatively rare in Iroquoian studies, especially in Canada, although Spaulding did some testing using Owasco ceramics in his search for types (Spaulding 1976). It has been used in the present study in a very limited and rudimentary manner.

One of the major problems concerning association analysis is establishing the degree of mathematical prediction that is considered to be meaningful. The significance level of a statistical measure of association is especially important in analytical attempts at generating typology. Often an arbitrary significance value (such as 5% for Chi squared) is chosen. Since the analytical procedure employed in this dissertation was largely comparative, I chose to consider significance levels of measures of association in the same manner, instead of establishing an arbitrary level of significance. For this purpose it was necessary to select a measure of strength of association, the values of which can be compared to each other. Since Goodman and Kruskal's tau (Blalock 1960) was useful in my M.A. research, I experimented with its use in this study.

The above procedures can be considered as the means of manipulating the data base at the inferential level of form. The ultimate objective and purpose of these procedures was to identify pattern in the data that

could be useful for interpretation and explanation at higher levels of inference. We now proceed to a discussion of patterns in terms of the articulation of the other levels of inference, keeping in mind that level of form is the foundation upon which the other levels area built.

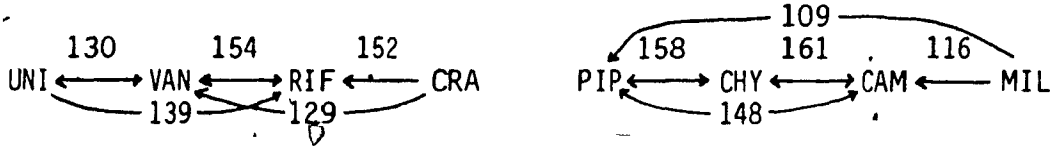
5.3.2 Space

The objectives of considering the ceramic data at the spatial level of inference were: (1) to identify variation in the ceramic data that could be considered essential for the investigation at the spatial level, (2) to identify variation that could be considered key or especially meaningful in spatial terms, and (3) to examine the variation for unexpected patterns or anomalies that could not be explained within the spatial context. In order to do this it was necessary to propose some hypotheses and make some predictions about the nature of key spatial patterns and then compare the variation in the data base with these predictions. These hypotheses were generated by considering the data in terms of both the 'primitive' assumption that, all other factors being equal, variation through space will approximate a regular clinal distribution, and the spatial component of the model proposed in Chapter 4.0. It was proposed in this model that a cluster of sites is evident in the Crawford Lake locale, including the Rife, Unick, Crawford Lake, and Van Eden sites, otherwise known as the Group 1 sites. It was also proposed that no such close spatial relationship is evident among the other four sites, including the Chypchar, Pipeline, Campbell and Milton sites, otherwise known as the Group 2 sites, or between the Group 1 and Group 2 sites.

From this two alternative hypotheses were proposed. If it is assumed that the spatial arrangement of the sites is accidental, then

the pattern of variability in the ceramic data should reflect no boundaries. If we assume that the spatial arrangement of the eight sites is directly responsible for any variation in the ceramic data, a distinct pattern of clustering among the Group 1 sites should be detected with little if any clustering among the Group 2 sites. Any other pattern would be anomalous. It was predicted, therefore, that variables that indicated clustering of the Group 1 sites were essential variables at the spatial level, and that any such clustering would be demonstrated most clearly in the tables of coefficients of similarity and the dendrograms displaying relationships of similarity among the variables defined in this study.

With these hypotheses in mind, the variables were examined for those that showed clustering of the Group 1 sites. To begin with the simplest indicator of clustering, the linear orders of sites presented in the matrices of Robinson-Brainerd coefficients of similarity (Tables 168 to 245) were considered. Clustering is indicated by the Double-link technique when the units being linked are separated into distinct groups with no connecting link between groups, as in the following example (taken from Table 7, pg. 157).



The results of the examination for clustering are summarized in Tables 246 and 247. The symbols are explained in the legend that follows the tables.

Table 246: Summary of Single and Double-link Clusters for Rim Section Attribute Variables

VARIABLES	FORMATS 1	2	3	4	5	6
Rim Form	B-	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
Rim Orientation		XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
Exterior Rim Profile			XXXXXX	XXXXXX	XXXXXX	XXXXXX
Interior Rim Profile			XXXXXX	XXXXXX	XXXXXX	XXXXXX
Angle of Lip to Interior	GI-	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
Collar Base Shape	B+	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
Collar Height			XXXXXX	XXXXXX	XXXXXX	XXXXXX
Lip Thickness	B-	B+	XXXXXX	XXXXXX	XXXXXX	XXXXXX
Collar Base Thickness			XXXXXX	XXXXXX	XXXXXX	XXXXXX
Rim Diameter at Lip	B-	B-(2+)	XXXXXX	XXXXXX	XXXXXX	XXXXXX
Interior Rim Element		B-	XXXXXX	XXXXXX	XXXXXX	XXXXXX
Interior Rim Motif	B-	B-	B-			XXXXXX
Lip Element	B-(2+)	B-	XXXXXX	XXXXXX	XXXXXX	XXXXXX
Lip Motif	B-(2+)	B-(2+)	B-	B-	B-	XXXXXX
Upper Rim Element	B-	B-	XXXXXX	XXXXXX	XXXXXX	XXXXXX
Upper Rim Motif	B-(1+)	B-	B-	B+	B+	XXXXXX
Secondary Rim Decoration	B-	B-	B-	B-	G1-	
Neck Element			XXXXXX	XXXXXX	XXXXXX	XXXXXX
Neck Motif				G1-	B-	
Secondary Neck Decoration		B-		B-	B-	

Table 247: Summary of Single and Double-link Clusters for Pipe Bowl Section Attribute Variables

VARIABLES	FORMATS 1	2	3	4	5	6
Bowl Orientation		XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
Exterior Bowl Profile	B+	B+	XXXXXX	XXXXXX	XXXXXX	XXXXXX
Interior Bowl Profile			XXXXXX	XXXXXX	XXXXXX	XXXXXX
Angle of Lip to Interior		XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
Lip Thickness		B-(2+)	XXXXXX	XXXXXX	XXXXXX	XXXXXX
Bowl Element	B-	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
Bowl Motif	B-	G2+	G2+	G2+	G2+	
Secondary Bowl Decoration						

Legend:

B+: Single and Double-link Clusters, both Groups

e.g. RIF -- UNI -- CRA -- VAN CHY -- PIP -- CAM -- MIL

B-(1+): Double-link Clusters, both Groups; Single-link Cluster, Group 1 only

e.g. RIF -- UNI -- CRA -- VAN CHY PIP CAM MIL

B-(2+): Double-link Clusters, both Groups; Single-link Cluster, Group 2 only

e.g. RIF UNI CRA VAN CHY -- PIP -- CAM -- MIL

B-: Double-link Clusters only, both Groups

e.g. RIF UNI CRA VAN CHY PIP CAM MIL

G2+: Single and Double-link Cluster, Group 2 only

e.g. CHY -- PIP -- CAM -- MIL

G1-: Double-link Cluster only, Group 1 only

e.g. RIF UNI CRA VAN

G2-: Double-link Cluster only, Group 2 only

e.g. CHY PIP CAM MIL

Although many of the variables demonstrated close relationships among the Group 1 sites, an anomalous pattern emerged that matched neither of the predictions outlined above. A surprisingly large number of variables indicate clustering among the Group 1 sites. Of the 57 linear orders calculated using the rim section variables of all versions, 34 showed the Group 1 sites as a linear cluster. This does not correspond with a prediction of random spatial distribution of the sites in Group 1, and this hypothesis was rejected. On the other hand, only three of these seriations (Table 172, Table 214, and Table 219) demonstrated orders that would correspond with the alternate prediction of clustering of Group 1 sites but not of Group 2. In none of the orders did a situation arise where Group 2 was clustered, but Group 1 was not. The other 32 orders show the Group 2 sites separated from the Group 1 sites in a linear cluster of their own. Since this latter pattern was so frequent, the rim section variables exhibiting it were considered to demonstrate essential spatial patterning.

A somewhat different pattern emerged on examination of the bowl section variables. In this case only five of the 22 linear orders showed a cluster of Group 1 sites, and all five also showed clustering of the Group 2 sites. These were considered essential spatial variables. On the other hand, four of the linear orders demonstrated clustering of the Group 2 sites, but not the Group 1 sites. As with the rim section attributes, these instances of clustering do not match either of the predictions posited above. They do, however, tend to support the distinct separation of Groups 1 and 2 sites.

The patterns exhibited by these variables became more apparent when the dendrograms displaying the two dimensional results of the cluster analysis were examined (Figures 58 to 135). These diagrams aid in

determining the degree of clustering among the groups of sites. A good example of strong clustering can be seen in Figure 11, the dendrogram produced from the table of coefficients of similarity for Emerson's pipe types (Table 5). This figure shows the Group 1 and Group 2 sites in fairly tight clusters, with a low degree of similarity between the two clusters. On inspection of the dendrograms for the spatially essential attribute variables, only four rim section variables and two bowl section variables (marked B+ in Tables 246 and 247) exhibited a degree of clustering comparable to that for the pipe types. Because of their strong degree of clustering within the two groups and separation between groups these variables were considered key spatial variables; that is, this pattern of variation was inferred to be strongly influenced by spatial factors.

The other essential rim and bowl section variables showed varying degrees of similarity among the sites of both groups. Of the 28 essential, but not key, rim section variables, 25 variables (marked with B- in Table 246) indicated relatively strong relationships between sites from Group 1 and Group 2 (and, of course, vice-versa). In contrast, only one of the bowl section variables (marked B- in Table 247) showed such a pattern. In fact, of the four bowl section variables that showed linear clustering of the Group 2 sites, there is no strong link between the Group 2 and the Group 1 sites.

In summary, the following patterns appear to be evident when the attribute variation is considered at the spatial level. The rim section variables indicate that there are two distinct clusters of sites (identical to what are here termed Group 1 and Group 2 sites). The Group 1 sites correspond to the geographic cluster of sites in the

Crawford Lake locale posited in the previous chapter, whereas the Group 2 sites do not correspond to a similar spatial cluster. There is evidence of a high degree of similarity between these two groups of sites indicated by the rim section variables. The bowl section variables also indicate some clustering that corresponds to the two groups of sites, but, in contrast to the rim section variables, there is a lesser degree of similarity between the two groups. The segregation of the groups of sites into two distinct groups in over half of the variables led to the rejection of both the hypotheses proposed at the beginning of this section. The distinction between the Group 1 and Group 2 sites was taken as an assumption, and a third, more complex hypothesis was formulated to deal with the anomaly. This hypothesis predicted that, although the spatial distinction between the two groups of sites is meaningful, the distinction cannot be explained in simple spatial terms, but that recourse must be made to a higher level of inference. The somewhat different patterns between the rim section and bowl section variables provide another anomaly that cannot be explained at the spatial level.

5.3.3 Time

In the previous section, I described how two spatial hypotheses were formulated and tested by comparing their inherent predictions with pattern that was elicited from the data through analytical manipulation at the level of form. In this case, because neither hypothesis was able to explain the pattern of variation apparent in the analytical entities, it was proposed that the emergent pattern was anomalous in spatial terms. According to the methodological model of ascending levels of inference it then became necessary to attempt an explanation of this

anomaly at the temporal level of inference.

The objectives of analysis at the temporal level were essentially the same as those stated above for the spatial level. It was necessary at this level to identify variation that was essential and, especially, key in terms of chronological change among the sites in the sample. In addition, if we follow the methodological model as portrayed in Figure 2, analysis at the temporal level also had to take into account the assumptions and inferences generated at the spatial level as discussed in the previous section. I was also, of course, searching for anomalies that cannot be explained at either the spatial or the temporal levels of inference.

It was noted in the previous chapter that radiocarbon dates were lacking for most of the sites in the sample at the time this study was undertaken, and the only firm chronometric date applied to the Crawford Lake site. I could not, therefore, look to absolute dating to indicate the chronological relationships of the sites under consideration, and had to rely on relative dating. As discussed here and elsewhere (see Chapter 2.0), seriation has been the primary technique for generating relative chronologies of Iroquoian sites in the absence of reliable radiocarbon or other means of chronometric dating, and, given the short term of occupation of Iroquoian sites, may still provide the most accurate relative dating method. Chronological seriation is essentially a clustering procedure that produces linear orders of sites that are inferred to be temporally significant. The techniques are the same as those described in the previous section. The difference lies simply in the interpretation of the resulting patterns, and, therefore, in the context in which attribute variation is explained. Debate concerning seriation of Iroquoian sites has concentrated on the analytical entities

employed as the basis of seriation, the entities of contention being mostly MacNeish's types versus attribute values (see Ramsden 1977). Keeping this in mind, we can interpret the objective of identification of essential and key attribute variation in this section as the search for a pattern that is useful for chronological seriation.

In order to identify temporally significant variation, it was necessary, as at the spatial level, to formulate alternative temporal hypotheses to account for the pattern exhibited by the variables to this point in the analysis. Firstly, two extremes were posited, both of which were based on the possibility that the relationships among the sites evident so far had nothing to do with time. One of these extremes was that the two groups of sites were completely separated in time and the relationships among them were accidental. Because a prediction of probable pattern in such a case would be random degrees of similarity among attribute variables, this hypothesis was rejected immediately on the grounds that the relationships between sites from different groups as indicated by the coefficients of similarity and dendrograms were too close to warrant such an assumption. As is indicated in Tables 246 and 247, very few of the variables display a strong degree of separation between the two groups of sites. The other extreme is a case in which all eight sites were contemporaneous and the distinctions between the two groups were due to factors other than time; in other words, there were two sets of sites both occupied at the same time, yet maintaining some form of separation. Since space had already been eliminated as a factor in the case of the Group 2 sites, simple physical separation could not be called upon to support such a hypothesis. Taking into account the spatial distribution of the sites, a prediction of probable

pattern in such a situation would be a high degree of internal homogeneity within each group compared to the relationship between the groups. It was demonstrated in the previous section that a large number of variables that were considered essential at the spatial level did not exhibit such a pattern, and even the key variables did not show a high degree of internal homogeneity within each group. Because of this pattern, the latter hypothesis was also rejected.

Secondly, two other hypotheses were formulated on the basis that the apparent pattern was related to variation through time. One hypothesis was that all of the variation among the sites was determined directly by temporal change. Taking into account the 'primitive' assumption that, all other factors being equal, variation through time will follow smooth clinal change, this hypothesis was rejected on the same grounds as the equivalent hypothesis at the spatial level: the evidence for some form of clustering among the sites was too strong. Another hypothesis was that the distinction between the two groups of sites was temporal, and that the boundary between them marked a chronological gap. A further variant was that the distinction marked a period of accelerated temporal change. These latter two hypotheses would account for the anomaly apparent in the pipe bowl variation.

Thirdly, a final, more complex hypothesis was formulated that attempted to take account of both spatial and temporal change. This hypothesis stated that the sites within a group were not contemporaneous, but formed a chronological sequence and that the two groups of sites were generally contemporaneous.

In order to test any of these hypotheses, essential and key attribute variation had to be identified. The prediction of variation stemming from our 'primitive' temporal assumption is that essential

variability will change in a regular fashion through time. Key attribute variability, in this case, is variability with sufficient structured regularity and complexity to allow us not only to seriate sites, but to recognize any anomalies that might occur, such as suggested in the second set of hypotheses above. It was necessary, therefore, to identify attribute variability that showed regular and patterned change among the sites under consideration.

During the course of my M.A. research, a set of procedures was developed and applied, and this process was followed and refined in the present study. The first step was to attempt to gain some rough notion of what the chronological relationships among the sites might have been. One aid in such an attempt was the seriation using MacNeish's types presented in Table 4. This seriation produced the following order of our eight sites: Unick - Rife - Chypchar - Crawford Lake - Pipeline - Van Eden - Campbell - Milton. The particular direction of this order was decided upon because the Milton site has higher percentages of both the Lawson Opposed and Lawson Incised types, both of which have been identified as later Iroquoian styles (see Wright 1966). This order provided a general template, and was interesting because it showed a mixing of the sites from the two groups. Another aid was a crude form of seriation first attempted in my M.A. research involving the generation of what I called modal and compromise orders of sites. These orders attempt to take into account the pattern contained in the attribute variables, assuming that at least some of this variation is temporal in significance. The modal order is simply the order of sites that occurs the most often. The compromise order involves simply counting the number of times that a site occurs in a position in the

orders, and generating a crude final order by placing each site in the position where it occurred the most often. Because the analysis of the variables at the spatial level indicated that a high proportion of the variation had some spatial significance in terms of a separation between the two groups of sites, it was clear that modal and compromise orders generated using all of the sites at once were likely to be highly skewed toward a spatial seriation. It was, therefore, decided to calculate the orders separately for each of Group 1 and Group 2. It was also decided, at this point in the analysis, to use the Format 1 (or most exclusive format) of the data to avoid any skewing that could take place because of lumping, and to use only the rim section variables because the bowl section variables seemed to be so highly influenced by the spatial separation. The results using these approaches are summarized in Tables 248 and 249, and produce the following orders of sites: Group 1: Unick - Rife - Van Eden - Crawford Lake; Group 2: Chypchar - Pipeline - Campbell - Milton. These orders so generated for each group of sites are very similar those seriated using MacNeish's types with the single exception of the reversal of the order of Crawford Lake and Van Eden. It was decided, therefore, to use these orders as a guide for evaluating seriated orders produced using a more complex and detailed approach, pursued below.

The second step in the search for key temporal variation was to isolate variables that showed some form of variation that could be inferred to be most significant at the temporal level. In my M.A. research, an adaptation of association analysis was employed as a rough indicator of possible essential and key variables. The rationale for the use of association analysis is essentially the same as that for seriation; the objective is to identify pattern that varies in a

Table 248: Seriated Orders of Sites for Variables (Format 1): Group 1

VARIABLE	POSITION 1st	2nd	3rd	4th
Rim Form	Unick	Rife	Van Eden	Cr. Lake
Rim Orient.	Rife	Unick	Cr. Lake	Van Eden
Ext. Profile	Van Eden	Unick	Rife	Cr. Lake
Int. Profile	Unick	Van Eden	Rife	Cr. Lake
Lip Angle	Rife	Unick	Van Eden	Cr. Lake
Collar Shape	Rife	Van Eden	Unick	Cr. Lake
Collar Hgt	Unick	Cr. Lake	Van Eden	Rife
Lip Thick.	Unick	Rife	Van Eden	Cr. Lake
Collar Thick.	Unick	Rife	Cr. Lake	Van Eden
Diameter	Unick	Rife	Cr. Lake	Van Eden
Int. Element	Van Eden	Unick	Rife	Cr. Lake
Int. Motif	Van Eden	Unick	Rife	Cr. Lake
Lip Element	Unick	Cr. Lake	Van Eden	Rife
Lip Motif	Unick	Cr. Lake	Van Eden	Rife
Rim Element	Van Eden	Unick	Rife	Cr. Lake
Rim Motif	Unick	Cr. Lake	Rife	Van Eden
Sec. Rim Mot.	Van Eden	Unick	Rife	Cr. Lake
Neck Element	Unick	Rife	Van Eden	Cr. Lake
Neck Motif	Unick	Rife	Van Eden	Cr. Lake
Sec.Neck.Mot	Unick	Van Eden	Cr. Lake	Rife
Modal Order	Unick	Rife	Van Eden	Cr. Lake
Compromise Order	Unick	Rife	Van Eden	Cr. Lake

Table 249: Seriated Orders of Sites for Variables (Format 1): Group 2

VARIABLE	POSITION 1st	2nd	3rd	4th
Rim Form	Chypchar	Pipeline	Milton	Campbell
Rim Orient.	Chypchar	Campbell	Milton	Pipeline
Ext. Profile	Chypchar	Campbell	Milton	Pipeline
Int. Profile	Campbell	Pipeline	Milton	Chypchar
Lip Angle	Chypchar	Pipeline	Campbell	Milton
Collar Shape	Pipeline	Chypchar	Milton	Campbell
Collar Hgt	Chypchar	Pipeline	Campbell	Milton
Lip Thick.	Chypchar	Campbell	Pipeline	Milton
Collar Thick.	Chypchar	Pipeline	Campbell	Milton
Diameter	Chypchar	Campbell	Pipeline	Milton
Int. Element	Campbell	Chypchar	Pipeline	Milton
Int. Motif	Campbell	Chypchar	Pipeline	Milton
Lip Element	Pipeline	Campbell	Chypchar	Milton
Lip Motif	Pipeline	Campbell	Chypchar	Milton
Rim Element	Pipeline	Chypchar	Campbell	Milton
Rim Motif	Chypchar	Pipeline	Campbell	Milton
Sec. Rim Mot.	Chypchar	Campbell	Pipeline	Milton
Neck Element	Chypchar	Pipeline	Milton	Campbell
Neck Motif	Chypchar	Pipeline	Milton	Campbell
Sec.Neck.Mot	Chypchar	Pipeline	Campbell	Milton
Modal Order	Chypchar	Pipeline	Campbell	Milton
Compromise Order	Chypchar	Pipeline	Campbell	Milton

structured manner from one site to another. The use of a statistical measure of mathematical association can be described as measuring how much information can be accurately predicted about the variation in one variable if the variation in another variable is understood. In the application used here, the understood variable was, of course, any one of the attribute variables for which the variation was known, while the other variable consisted of the site affiliation. What was being measured, therefore, was the degree to which knowledge of variation in an attribute variable could predict relationships among the sites. For example, if the understood variable is upper rim motif, for which the frequencies of values are known for all of the sites, a high tau value indicates the possibility that there is a high degree of patterned variation among the sites that may be related to structured change over time. Accordingly, the Goodman and Kruskal's tau statistic mentioned above was calculated for all of the rim and bowl section variables in their raw or most exclusive format (Format 1). The calculation produces a tau value for both the rows and columns of a table; in this analysis the average of these two tau values was employed. The statistic was calculated using the entire sample, and then separately for both of the two groups. The results are presented in Tables 250 and 251.

The values in Tables 250 and 251 indicate several examples of a greater degree of association between rim section attribute variables and site affiliation. The clearest of these are the values for Upper Rim Motif. The tau value for this variable was consistently greater than any of the others. The second highest consistent set of tau values are those for Neck Motif. These two variables were considered to show possible essential variation in chronological terms. There were other relatively high values of tau, but they are not consistent from Group 1

Table 250: Goodman and Kruskal's Tau Values for All Sites
Site by Rim Section Attribute Variable (Format 1)

VARIABLES	TAU VALUES All Sites	Group 1	Group 2
Rim Form	0.0151	0.0019	0.0069
Rim Orientation	0.0518	0.0558	0.0608
Exterior Profile	0.0160	0.0076	0.0147
Interior Profile	0.0194	0.0170	0.0220
Lip Angle	0.0264	0.0045	0.0331
Collar Base Shape	0.1165	0.0316	0.0417
Collar Height	0.0389	0.0838	0.0410
Lip Thickness	0.0181	0.0144	0.0198
Collar Base Thickness	0.0128	0.0203	0.0157
Diameter at Lip	0.0440	0.0937	0.0494
Interior Decorative Element	0.0433	0.0092	0.0511
Interior Decorative Motif	0.0461	0.0242	0.0487
Lip Decorative Element	0.0362	0.0391	0.0088
Lip Decorative Motif	0.0413	0.0481	0.0138
Upper Rim Decorative Element	0.0265	0.0238	0.0265
Upper Rim Decorative Motif	0.0970	0.0855	0.1247
Secondary Rim Decoration	0.0268	0.0339	0.0324
Neck Decorative Element	0.0252	0.0115	0.0269
Neck Decorative Motif	0.0453	0.0659	0.0585
Secondary Neck Decoration	0.0540	0.0957	0.0373

Table 251: Goodman and Kruskal's Tau Values for All Sites: Bowl Attribute Variables (Format 1)

VARIABLES	TAU VALUES All Sites	Group 1	Group 2
Exterior Bowl Orientation	0.0355	0.0259	0.0259
Exterior Bowl Profile	0.1520	0.0306	0.0255
Interior Bowl Profile	0.0315	0.0159	0.0299
Angle of Lip to Interior	0.0416	0.0324	0.0726
Lip Thickness	0.0523	0.0536	0.0656
Bowl Element	0.0623	0.0257	0.0384
Bowl Motif	0.1159	0.1256	0.0714
Secondary Bowl Decoration	0.0590	0.0402	0.0498

to Group 2, or for all of the sites taken together. These include Collar Base Shape, Rim Diameter at Lip, Secondary Rim Decoration, Secondary Neck Decoration, Exterior Bowl Profile, and Bowl Motif.

Following this, it was necessary to evaluate the variation in the two variables identified above as possibly essential at the temporal level to see if any of their formats could be considered to show key variability. Following the assumption of smooth and regular change through time of temporally significant variation, the behaviour of the attributes in each of the two variables in their various degrees of lumping was investigated by examining the histograms for Upper Rim Motif Format 2 (Figure 27), Format 3 (Figure 33), Format 4 (Figure 39), and Format 5 (Figure 45), and Neck Motif Format 2 (Figures 29), Format 3 (Figure 35), Format 4 (Figure 41), and Format 5 (Figure 47). These histograms were examined from the perspective of the tentative orders generated through MacNeish's types and the modal and compromise approaches. The clearest example of regular variation from site to site

for both the two groups of sites was discovered in the histogram for Upper Rim Motif. Although the individual percentages of the attribute values do not vary in a regular linear manner, the relationships among them do. The most striking was the relationship between Non-Horizontal Motif and Horizontal Motif. The relative frequency of Non-horizontal changes regularly with respect to Horizontal in almost every case. In a more general pattern, the overall complexity of motif also tends to vary in a linear fashion. Both of these patterns can be seen most clearly in Upper Rim Motif Format 3 (Figure 33) if the relative chronology presented above holds true. This variable continued to preserve the clustered distinction between Groups 1 and 2, and the distinction became clearer upon examining the variation. Although both of the patterns of regular variation can be seen in both groups of sites and these patterns tend to overlap between the two groups, there is a difference in degree of change. For example, the degree to which the simpler motifs vary with respect to the more complex motifs is different between the two groups of sites. On the other hand, the dendrogram (Figure 94) shows a high degree of similarity between sites crossing the group boundary. The seriated order provided by this variable approximated, but did not duplicate, the tentative orders proposed above.

A similar clear, regular pattern was not in evidence for the versions of Neck Motif. The only pattern that emerged was the tendency for the change to become more regular as the data was considered in successively more inclusive (lumped) formats. The seriated orders of sites using the various versions of this variable do not duplicate, or even approximate, the tentative orders previously posited.

Clearly, examination of individual attribute variables did not aid

in actually clarifying, in detail, the chronological relationships among the sites, or explaining the clustering that occurs between the two groups of sites. The degree of difference between Groups 1 and 2 sites indicated by Upper Rim Motif Format 3, although now clearer, did not allow the orders of sites generated to be completely trusted. Neck Motif did not show regular change from site to site that could be interpreted as temporally significant. It remained, then, to consider a higher order analytical entity, at the level of attribute combination, as a seriation entity. Because Upper Rim Motif and Neck Motif had shown the highest tau values, it was decided to evaluate a variable of attribute combinations generated using the co-occurring values of these two attribute variables. Since Upper Rim Motif Format 3 showed the most patterned and regular change in variability among the sites, it was chosen as one of the variables making up the attribute combination. Since no version of Neck Motif was clearly indicated, all versions were investigated. The same procedures as those employed to examine attribute variables were used: frequencies and percentages were computed, histograms constructed, coefficients of similarity tabulated, and both Single and Double-link clustering performed producing dendrograms. Five variables of attribute combinations were generated; the calculated coefficients of similarity are presented in Tables 252 to 256.

On the one hand, none of the five orders generated using the Double-link method duplicated the tentative chronological orders for the separate groups or for all of the sites taken together. On the other hand, three of the five orders were different from the tentative order only in a reversal of the Rife and Unick sites, producing the following order: Rife - Unick - Crawford Lake - Van Eden for Group 1; and

Table 252: Coefficients of Similarity for Vessel Attributes
Upper Rim Motif (Format 3) x Neck Motif (Format 2)

	VAN	RIF	UNI	CRA	CHY	PIP	CAM	MIL
VAN	-----	143.33	133.70	141.53	117.09	127.98	121.40	103.71
RIF	143.33	-----	154.29	143.91	126.92	135.95	103.08	72.43
UNI	133.70	154.29	-----	146.15	104.88	111.86	90.86	68.00
CRA	141.53	143.91	146.15	-----	121.59	117.29	96.63	78.85
CHY	117.09	126.92	104.88	121.59	-----	149.20	107.24	101.72
PIP	127.98	135.95	111.86	117.29	149.20	-----	129.41	106.15
CAM	121.40	103.08	90.86	96.63	107.24	129.41	-----	129.40
MIL	103.71	72.43	68.00	78.85	101.72	106.15	129.40	-----

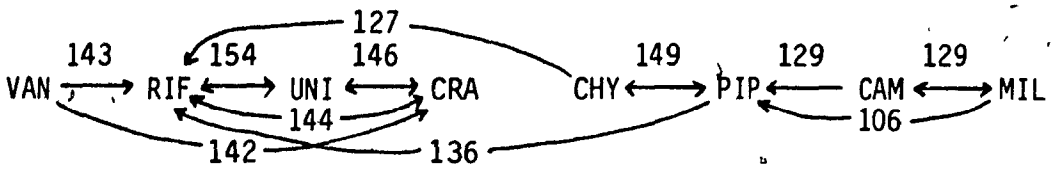


Table 253: Coefficients of Similarity for Vessel Attributes
Upper Rim Motif (Format 3) x Neck Motif (Format 3)

	VAN	RIF	UNI	CRA	CHY	PIP	CAM	MIL
VAN	------	144.76	133.70	142.21	118.47	129.53	121.40	105.71
RIF	144.76	------	154.29	143.91	126.97	136.46	103.79	72.43
UNI	133.70	154.29	------	147.85	108.73	112.89	91.24	68.00
CRA	142.21	143.91	147.85	------	122.97	118.32	96.63	78.85
CHY	118.47	126.97	108.73	122.97	------	150.22	108.61	102.34
PIP	129.53	136.46	112.89	118.32	150.22	------	130.95	107.18
CAM	121.40	103.79	91.24	96.63	108.61	130.95	------	129.40
MIL	105.71	72.43	68.00	78.85	102.34	107.18	129.40	------

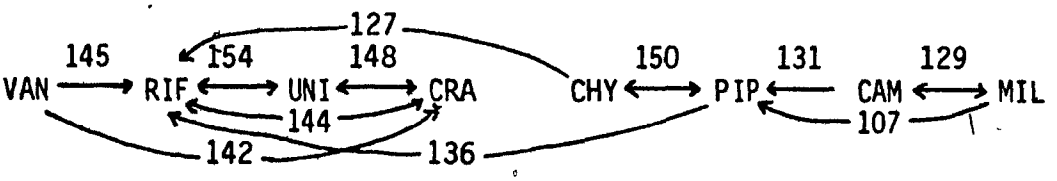


Table 254: Coefficients of Similarity for Vessel Attributes
Upper Rim Motif (Format 3) x Neck Motif (Format 4)

	RIF	UNI	CRA	VAN	CHY	PIP	CAM	MIL
RIF	------	160.27	151.08	148.33	132.44	137.29	104.50	74.29
UNI	160.27	------	157.17	141.39	114.54	117.77	95.09	70.00
CRA	151.08	157.17	------	153.03	126.04	135.78	110.11	88.10
VAN	148.33	141.39	153.03	------	124.37	136.67	127.46	108.10
CHY	132.44	114.54	126.04	124.37	------	153.99	112.57	107.10
PIP	137.29	117.77	135.78	136.67	153.99	------	131.59	109.63
CAM	104.50	95.09	110.11	127.46	112.57	131.59	------	137.62
MIL	74.29	70.00	88.10	108.10	107.10	109.63	137.62	------

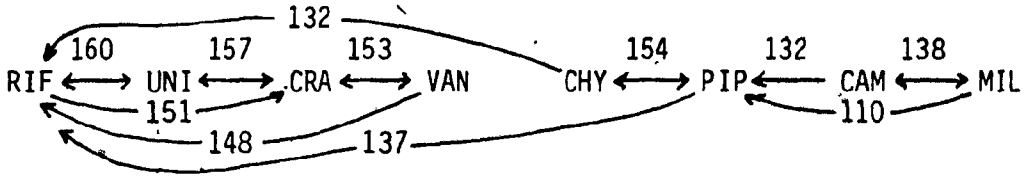


Table 255: Coefficients of Similarity for Vessel Attributes
Upper Rim Motif (Format 3) x Neck Motif (Format 5)

	RIF	UNI	CRA	VAN	CHY	PIP	CAM	MIL
RIF	------	160.27	151.08	148.57	132.44	137.29	104.67	74.29
UNI	160.27	------	157.17	141.39	114.54	117.77	95.09	70.00
CRA	151.08	157.17	------	153.03	126.04	135.78	110.11	88.10
VAN	148.57	141.39	153.03	------	124.37	136.67	127.46	108.10
CHY	132.44	114.54	126.04	124.37	------	153.99	112.57	107.10
PIP	137.29	117.77	135.78	136.67	153.99	------	131.59	109.63
CAM	104.67	95.09	110.11	127.46	112.57	131.59	------	137.62
MIL	74.29	70.00	88.10	108.10	107.10	109.63	137.62	------

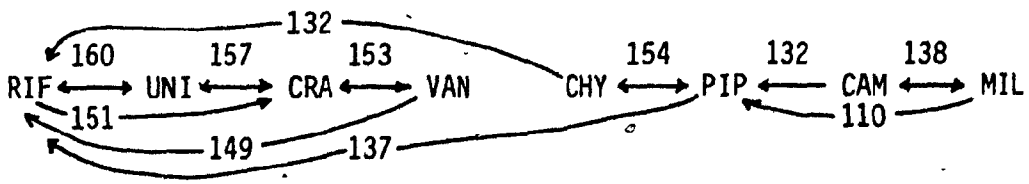
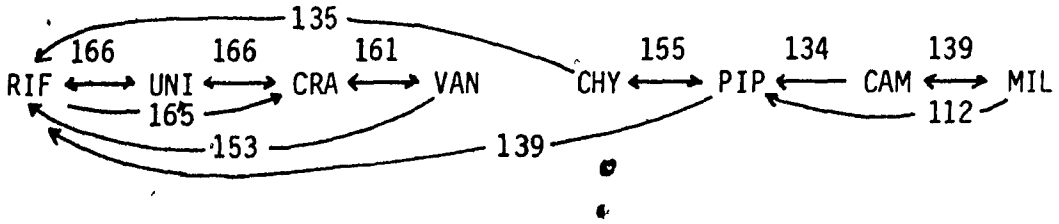


Table 256: Coefficients of Similarity for Vessel Attributes
Upper Rim Motif (Format 3) x Neck Motif (Format 6)

	RIF	UNI	CRA	VAN	CHY	PIP	CAM	MIL
RIF	------	165.99	164.64	153.10	135.25	137.29	107.26	76.43
UNI	165.99	------	166.10	150.00	114.54	122.13	97.40	73.85
CRA	164.64	166.10	------	161.30	128.49	138.50	114.12	88.10
VAN	153.10	150.00	161.30	------	125.75	137.18	127.46	108.10
CHY	135.25	114.54	128.49	125.75	------	155.37	116.22	108.48
PIP	137.29	122.13	138.50	137.18	155.37	------	133.52	111.69
CAM	107.26	97.40	114.12	127.46	116.22	133.52	------	139.27
MIL	76.43	73.85	88.10	108.10	108.48	111.69	139.27	------



Chypchar - Pipeline - Campbell - Milton for Group 2. Since the seriation that produced this order employed a higher level entity (variables of attribute combinations), it was decided that this order deserved serious consideration. In addition, the coefficients of similarity for variables of attribute combinations showed significant overlap between Group 1 and Group 2 of a nature that could be used to indicate the chronological relationships between the two groups of sites. This overlap is shown in Table 252, for example, by the relatively high coefficients of similarity between Chypchar and Pipeline in Group 2 and sites (such as Rife) in Group 1.

One means of evaluating the strength of a seriation is to inspect the ordered matrix of coefficients of similarity for consistency (Leroy Johnson 1968). As noted by Brainerd (1951), a perfectly ordered matrix will have the coefficients arranged in descending order away from the central diagonal in all directions. Upon examination of Tables 252 to 256, it was noted that none of these ordered matrices held strictly to

such a pattern, even for the sites in the separate groups. It was decided, therefore, to generate an even more complex variable of attribute combinations by correlating an additional variable with Upper Rim Motif Format 3 and Neck Motif. The variable Rim Form was chosen as the additional one for two reasons. Firstly, the two variables of decoration (Upper Rim and Neck Motif) already combined are prominent in identifying MacNeish's types, and Rim Form was a third variable that MacNeish intuitively considered significant. Secondly, an attribute combination of Rim Form, Collar or Collarless Motif (the equivalent of Upper Rim Motif), and Neck Motif had been used successfully for seriation in my M.A. research. The results of calculating coefficients of similarity using Rim Form, Upper Rim Motif Format 3, and five formats of Neck Motif are presented in Tables 257 to 261. Examination of these tables showed that once again the orders of Rife - Unick - Crawford Lake - Van Eden for Group 1, and Chypchar - Pipeline - Campbell - Milton for Group 2 predominated in three out of five cases and that significant overlap between the two groups continued to be indicated. In addition, one variable (Rim Form + Upper Rim Motif Format 3 + Neck Motif Format 6) produced a table (Table 261) in which the order of sites listed above was evident and the coefficients for the sites were arranged in almost perfect descending order from the diagonal. This final variable of attribute combinations was, therefore judged to be the most significant, or key, in temporal terms. The frequencies and percentages of the values of this variable are presented in Table 262.

Table 257: Coefficients of Similarity for Vessel Attributes
Rim Form x Upper Rim Motif (Format 3)
x Neck Motif (Format 2)

	UNI	RIF	CRA	VAN	CHY	PIP	CAM	MIL
UNI	------	143.74	135.07	128.02	86.74	100.08	85.08	62.15
RIF	143.74	------	139.66	126.90	114.70	130.13	94.92	69.57
CRA	135.07	139.66	------	134.14	110.04	107.63	94.24	78.85
VAN	128.02	126.90	134.14	------	108.57	121.36	117.93	99.33
CHY	86.74	114.70	110.04	108.57	------	144.57	97.99	98.34
PIP	100.08	130.13	107.63	121.36	144.57	------	120.15	98.79
CAM	85.08	94.92	94.24	117.93	97.99	120.15	------	120.87
MIL	62.15	69.57	78.85	99.33	98.34	98.79	120.87	------

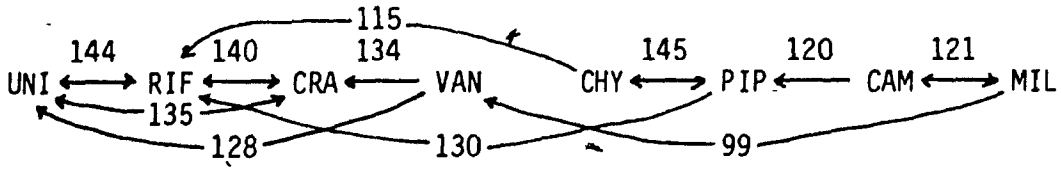


Table 258: Coefficients of Similarity for Vessel Attributes
Rim Form x Upper Rim Motif (Format 3)
x Neck Motif (Format 3)

	UNI	RIF	CRA	VAN	CHY	PIP	CAM	MIL
UNI	------	143.74	136.77	128.02	88.12	100.59	85.46	62.15
RIF	143.74	------	139.66	127.62	114.75	131.16	94.92	69.57
CRA	136.77	139.66	------	134.14	111.42	108.66	94.24	78.85
VAN	128.02	127.62	134.14	------	109.95	122.90	117.93	99.33
CHY	88.12	114.75	111.42	109.95	------	145.60	99.37	98.97
PIP	100.59	131.16	108.66	122.90	145.60	------	121.70	99.82
CAM	85.46	94.92	94.24	117.93	99.37	121.70	------	120.87
MIL	62.15	69.57	78.85	99.33	98.97	99.82	120.87	------

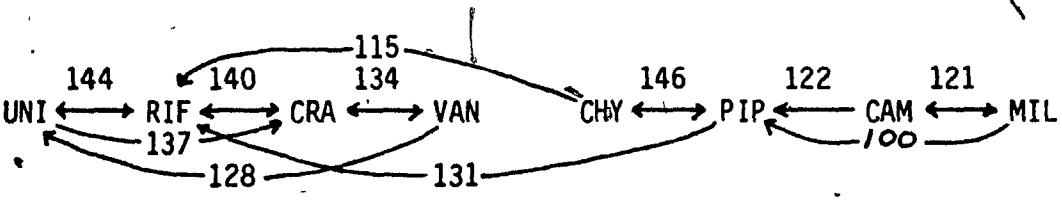


Table 259: Coefficients of Similarity for Vessel Attributes
Rim Form x Upper Rim Motif (Format 3)
x Neck Motif (Format 4)

	RIF	UNI	CRA	VAN	CHY	PIP	CAM	MIL
RIF	------	150.00	142.07	130.00	120.22	131.99	95.63	72.14
UNI	150.00	------	144.26	136.63	97.77	105.98	90.46	66.15
CRA	142.07	144.26	------	147.58	114.49	126.13	107.72	88.10
VAN	130.00	136.63	147.58	------	114.71	129.99	123.99	103.71
CHY	120.22	97.77	114.49	114.71	------	149.36	102.16	103.10
PIP	131.99	105.98	126.13	129.99	149.36	------	122.34	104.55
CAM	95.63	90.46	107.72	123.99	102.16	122.34	------	128.21
MIL	72.14	66.15	88.10	103.71	103.10	104.55	128.21	------

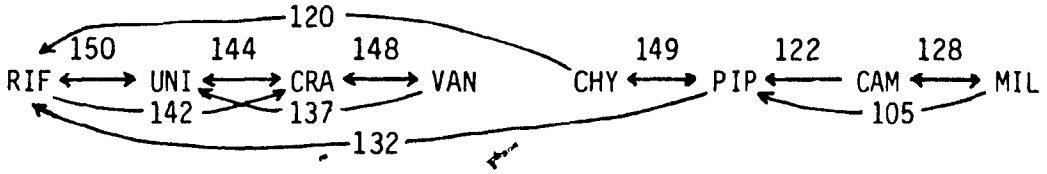


Table 260: Coefficients of Similarity for Vessel Attributes
Rim Form x Upper Rim Motif (Format 3)
x Neck Motif (Format 5)

	RIF	UNI	CRA	VAN	CHY	PIP	CAM	MIL
RIF	------	150.00	142.07	130.71	120.22	131.99	96.35	72.14
UNI	150.00	------	144.26	136.63	97.77	105.98	90.46	66.15
CRA	142.07	144.26	------	147.58	114.49	126.13	107.72	88.10
VAN	130.71	136.63	147.58	------	114.71	129.99	123.99	103.71
CHY	120.22	97.77	114.49	114.71	------	149.36	102.16	103.10
PIP	131.99	105.98	126.13	129.99	149.36	------	122.34	104.55
CAM	96.35	90.46	107.72	123.99	102.16	122.34	------	128.21
MIL	72.14	66.15	88.10	103.71	103.10	104.55	128.21	------

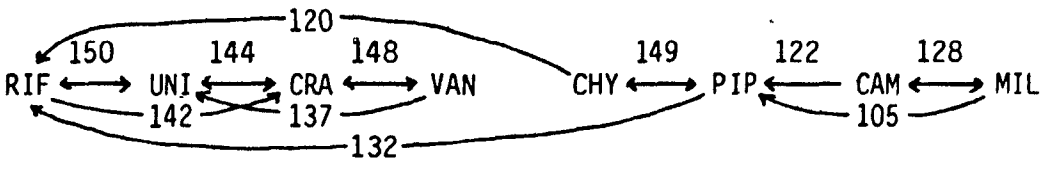


Table 261: Coefficients of Similarity for Vessel Attributes
Rim Form x Upper Rim Motif (Format 3)
x Neck Motif (Format 6)

	RIF	UNI	CRA	VAN	CHY	PIP	CAM	MIL
RIF	------	154.12	153.93	137.86	123.03	132.50	99.81	74.29
UNI	154.12	------	155.35	144.87	97.77	110.34	92.77	70.00
CRA	153.93	155.35	------	156.17	116.94	129.36	112.96	88.10
VAN	137.86	144.87	156.17	------	117.22	131.07	123.99	103.71
CHY	123.03	97.77	116.94	117.22	------	150.22	106.79	104.48
PIP	132.50	110.34	129.36	131.07	150.22	------	126.45	107.12
CAM	99.81	92.77	112.96	123.99	106.79	126.45	------	129.58
MIL	74.29	70.00	88.10	103.71	104.48	107.12	129.58	------

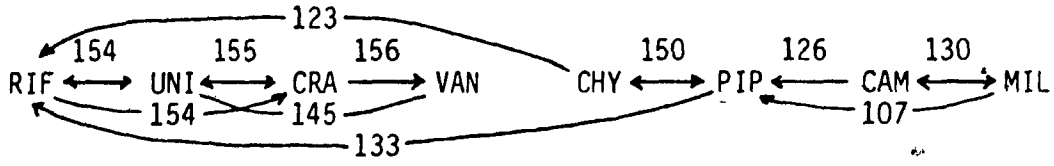


Table 262. Frequencies of Attribute Combinations
Rim Form + Upper Rim Motif (Format 3)
+ Neck Motif (Format 6)

	SITES							
	Cr. Lake		Rife		Unick		Van Eden	
	N	%	N	%	N	%	N	%
CD + A + A	1	0.85	0	0.00	0	0.00	0	0.00
CD + BAA + A	8	6.78	7	2.50	0	0.00	12	14.29
CD + BAA + P	26	22.03	41	14.64	10	19.23	19	22.62
CD + BAB + A	18	15.25	56	20.00	7	13.46	8	9.52
CD + BAB + P	13	11.02	20	7.14	3	5.77	5	5.95
CD + CAA + A	0	0.00	1	0.36	0	0.00	0	0.00
CD + CAA + P	2	1.69	6	2.14	1	1.92	0	0.00
CD + CAB + A	0	0.00	0	0.00	0	0.00	0	0.00
CD + CAB + P	0	0.00	0	0.00	0	0.00	0	0.00
CD + CAC + A	2	1.69	10	3.57	2	3.85	3	3.57
CD + CAC + P	2	1.69	13	4.64	1	1.92	6	7.14
CD + DAA + A	0	0.00	0	0.00	0	0.00	0	0.00
CD + DAA + P	0	0.00	0	0.00	0	0.00	0	0.00
CD + DDA + A	0	0.00	3	1.07	0	0.00	0	0.00
CD + DDA + P	2	1.69	5	1.79	1	1.92	2	2.38
CD + DGA + A	3	2.54	2	0.71	0	0.00	0	0.00
CD + DGA + P	0	0.00	0	0.00	0	0.00	0	0.00
CD + FAB + A	5	4.24	11	3.93	4	7.69	4	4.76
CD + FAB + P	22	18.64	62	22.14	14	26.92	14	16.67
CD + FAD + A	0	0.00	0	0.00	0	0.00	1	1.19
CD + FAD + P	1	0.85	0	0.00	1	1.92	0	0.00
CD + IAB + A	0	0.00	2	0.71	0	0.00	0	0.00
CD + IAB + P	1	0.85	4	1.43	0	0.00	0	0.00
CD + LAB + A	0	0.00	0	0.00	0	0.00	0	0.00
CD + LAB + P	0	0.00	0	0.00	0	0.00	0	0.00
CD + LJB + A	0	0.00	0	0.00	0	0.00	0	0.00
CD + LJB + P	0	0.00	1	0.36	0	0.00	0	0.00
CS + A + A	0	0.00	0	0.00	0	0.00	1	1.19
CS + BAA + A	0	0.00	2	0.71	1	1.92	1	1.19
CS + BAA + P	0	0.00	7	2.50	0	0.00	0	0.00
CS + BAB + A	6	5.08	18	6.43	3	5.77	3	3.57
CS + BAB + P	2	1.69	1	0.36	2	3.85	2	2.38
CS + CAA + P	0	0.00	0	0.00	1	1.92	0	0.00
CS + CAC + A	0	0.00	1	0.36	0	0.00	0	0.00
CS + CAC + P	0	0.00	3	1.07	0	0.00	0	0.00
CS + DAA + A	0	0.00	0	0.00	0	0.00	0	0.00
CS + DDA + A	0	0.00	0	0.00	0	0.00	0	0.00
CS + DDA + P	0	0.00	0	0.00	0	0.00	0	0.00
CS + FAB + A	0	0.00	1	0.36	0	0.00	0	0.00
CS + FAB + P	3	2.54	3	1.07	1	1.92	3	3.57
CS + LJB + P	1	0.85	0	0.00	0	0.00	0	0.00
EV + BAA + A	0	0.00	0	0.00	0	0.00	0	0.00
	118		280		52		84	

Rim Form: CD = Collared; CS = Collarless; EV = Everted Lip
Upper Rim Motif: see Appendix C
Neck Motif: A = Absent; P = Present

Table 262. (cont.) Frequencies of Attribute Combinations
Rim Form + Upper Rim Motif (Format 3)
+ Neck Motif (Format 6)

	SITES							
	Chypchar		Campbell		Pipeline		Milton	
	N	%	N	%	N	%	N	%
CD + A + A	0	0.00	1	0.58	1	0.26	1	1.00
CD + BAA + A	19	13.10	15	8.67	31	7.97	24	24.00
CD + BAA + P	20	13.79	58	33.53	92	23.65	25	25.00
CD + BAB + A	36	24.83	15	8.67	82	21.08	1	1.00
CD + BAB + P	6	4.14	7	4.05	15	3.86	3	3.00
CD + CAA + A	1	0.69	2	1.16	6	1.54	2	2.00
CD + CAA + P	0	0.00	1	0.58	1	0.26	1	1.00
CD + CAB + A	2	1.38	0	0.00	0	0.00	0	0.00
CD + CAB + P	2	1.38	0	0.00	0	0.00	0	0.00
CD + CAC + A	20	13.79	2	1.16	68	17.48	7	7.00
CD + CAC + P	2	1.38	9	5.20	18	4.63	0	0.00
CD + DAA + A	1	0.69	1	0.58	1	0.26	5	5.00
CD + DAA + P	1	0.69	3	1.73	2	0.51	1	1.00
CD + DDA + A	4	2.76	8	4.62	6	1.54	6	6.00
CD + DDA + P	3	2.07	15	8.67	0	0.00	10	10.00
CD + DGA + A	5	3.45	1	0.58	2	0.51	1	1.00
CD + DGA + P	2	1.38	2	1.16	0	0.00	3	3.00
CD + FAB + A	6	4.14	3	1.73	8	2.06	2	2.00
CD + FAB + P	9	6.21	6	3.47	31	7.97	1	1.00
CD + FAD + A	1	0.69	0	0.00	1	0.26	0	0.00
CD + FAD + P	0	0.00	0	0.00	0	0.00	0	0.00
CD + IAB + A	0	0.00	1	0.58	0	0.00	0	0.00
CD + IAB + P	2	1.38	0	0.00	2	0.51	0	0.00
CD + LAB + A	1	0.69	7	4.05	0	0.00	1	1.00
CD + LAB + P	1	0.69	1	0.58	0	0.00	1	1.00
CD + LJB + A	0	0.00	2	1.16	1	0.26	0	0.00
CD + LJB + P	0	0.00	0	0.00	0	0.00	0	0.00
CS + A + A	0	0.00	0	0.00	2	0.51	0	0.00
CS + BAA + A	0	0.00	1	0.58	3	0.77	0	0.00
CS + BAA + P	1	0.69	2	1.16	6	1.54	3	3.00
CS + BAB + A	0	0.00	1	0.58	4	1.03	1	1.00
CS + BAB + P	0	0.00	1	0.58	1	0.26	0	0.00
CS + CAA + P	0	0.00	0	0.00	0	0.00	0	0.00
CS + CAC + A	0	0.00	0	0.00	0	0.00	0	0.00
CS + CAC + P	0	0.00	0	0.00	1	0.26	0	0.00
CS + DAA + A	0	0.00	0	0.00	1	0.26	0	0.00
CS + DDA + A	0	0.00	1	0.58	1	0.26	0	0.00
CS + DDA + P	0	0.00	1	0.58	0	0.00	0	0.00
CS + FAB + A	0	0.00	1	0.58	0	0.00	0	0.00
CS + FAB + P	0	0.00	4	2.31	2	0.51	1	1.00
CS + LJB + P	0	0.00	0	0.00	0	0.00	0	0.00
EV + BAA + A	0	0.00	1	0.58	0	0.00	0	0.00
	145		173		389		100	

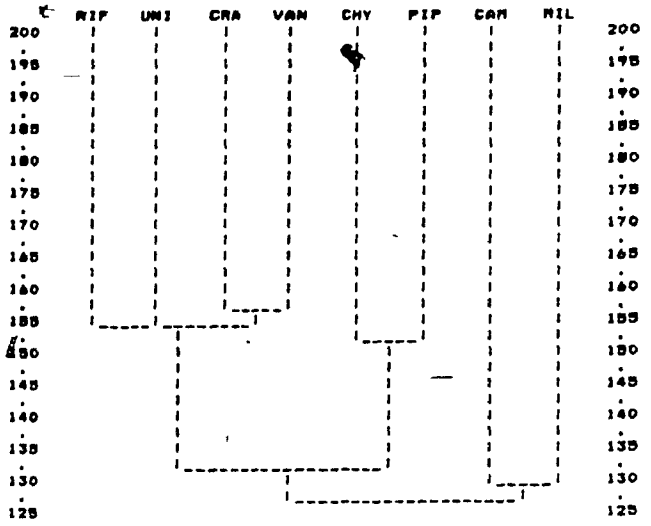
(CD = Collared; CS = Collarless; EV = Everted Lip)
Upper Rim Motif: see Appendix C
Neck Motif: A = Absent; P = Present

In light of the above discussion and results, the second set of hypotheses posited at the beginning of this section was reviewed. They predicted that the boundary between the two sets of sites was due to temporal differences, either a chronological gap or a period of accelerated change. The degree of temporal overlap evident between the two groups of sites weighs against these hypotheses, and made it necessary to consider the third hypothesis. The final step in the examination of chronology was, therefore, to determine the temporal relationships between the two groups of sites.

The coefficients of similarity in Table 261 indicate overlap between the two groups of sites, but the spatial distinction between them is preserved when the Double-link method of cluster analysis is applied. Because of this it was impossible to produce a detailed seriation of all of the sites in the sample by using the variable of attribute combinations as a seriation entity. The Single-link approach, on the other hand, produced results that appear to illustrate the temporal relationship more clearly. The relationship among the sites based on this approach using the variable of attribute combinations is illustrated by the dendrogram in Figure 136. This diagram shows that the greatest degree of overlap is between the sites of Group 1 and Chypchar and Pipeline of Group 2.

In order to examine this overlap in more detail, the individual values of attribute variables and the combination variable were examined. As discussed above, the most regular variation was noted among the values for Upper Rim Motif Format 3 (Tables 104, 105 and 206, and Figure 33). Two general trends were identified: a regular change of decreasing percentages of horizontal (BAB) motif in comparison to non-horizontal motifs (BAA), and an overall decrease in complexity of

Figure 136: Dendrogram for Rim Section Attribute Combination Rim Form + Upper Rim Motif (V3) + Neck Motif (V6)



motif. The nature of these trends was examined with reference to both groups of sites, and the following relative ordering of these sites was postulated:

RIFE - UNICK - CRAWFORD LAKE - VAN EDEN

CHYPCHAR - PIPELINE - CAMPBELL - MILTON

> earliest - - - - - > > > - - - - - - - - latest >

The nature of these trends became clearer when the values of the combination variable were examined in more detail. In Table 162 it can be seen that the nature of the shift toward a preponderance of non-horizontal motifs as opposed to horizontal motifs through time is somewhat similar between the two groups, especially if Chypchar and Pipeline are compared to the Group 1 sites. In contrast, an examination of the dominant complex motifs in the two groups of sites showed where they were quite different. Whereas the Group 2 potters chose to favour

the attribute combination that I have designated as non-horizontal upper rim motif superimposed with linear dashes on collared pots with no neck decoration (CD + CAC + A), the Group 1 sites show a much greater choice of what I have interpreted as the more complex attribute combination of non-horizontal over horizontal upper rim motif on collared pots with some form of neck decoration (CD + FAB + P). This comparison supported the temporal overlap of the two groups of sites proposed above.

The temporal inferences generated through this analysis tended to support the third hypothesis proposed in the early part of this section of two contemporaneous groups of sites, with the sites within each group being arranged in a temporal series. Since the second set of hypotheses was rejected the formal anomaly posited for the pipe bowl section remains unexplained. In fact, this anomaly can be said to be more important since it could not be accounted for in either spatial or temporal terms. It remained to attempt its explanation at higher levels of inference.

5.3.4 Economy

The objectives of inference at the economic level of inference for this particular study were relatively straightforward. It was necessary to determine if any of the variation in the ceramic sample under examination, and especially the variation in the pipe bowl section data, could be explained in terms of functional differentiation. This problem was approached at two levels of complexity. It was possible that the variation evident in the bowl section data was caused by the pipes being used for differing purposes. It would be expected, however, that if this was the case the variation in the pipes would be reflected consistently throughout the variables of bowl section shape.

Examination of the dendrograms for these variables in Figures 113 to 117 and summarized in Table 247 indicated that strong clustering occurs in only one variable of bowl shape (Exterior Bowl Profile). Consequently, the hypothesis of differing pipe functions was rejected.

The second hypothesis was that the sites from which the artifacts were recovered represented differing functional entities. Such a case would be represented if one of the groups of sites was a set of villages whereas the other group was a set of contemporaneous special purpose sites such as farming hamlets. An argument based on site size countering this proposal was advanced in the previous chapter, but it was necessary to pursue such a possibility using the analytical entities here defined. It was decided, therefore, to examine the pottery variables in light of the following hypothesis. If there were pervasive functional differences between the two group of sites, these differences would have been reflected by variation in pot function. For example, if one group of sites was a set of hamlets, it would not be expected that large vessels used for long term storage would be recovered. Unfortunately, as noted by Braun (1983), very little research has been conducted concerning the economic aspects of pottery. It was possible, however, to make some predictions as to how differing pot function would be reflected in the analytical variables, if certain assumptions were made. It was assumed that differing pot functions would be reflected most directly in variation of pot size and shape. Of the analytical variables of rim section shape defined in this study it was assumed that those that would vary most directly as a reflection of the shape of the whole pots were related to rim section size. These essential variables were Collar Height, Lip Thickness, Collar Base Thickness, and Rim

Diameter at Lip. Of these, it was assumed that the latter could be considered a relatively key indicator of vessel size. Keeping these assumptions in mind, the essential variables were examined for evidence of a distinct and consistent difference in size of pots between the two groups of sites. The dendrograms for these variables indicated that only two of them, Lip Thickness and Rim Diameter at Lip in both formats demonstrated Double-link clustering between the two groups of sites. The key variable, Rim Diameter at Lip, did not however, show any strong degree of Single-link clustering, and, in fact, the Format 1 dendrogram (Figure 67) demonstrated a strong degree of relationship between the two clusters. In addition, the histograms for the values of both formats of Rim Diameter of Lip (Figures 20 and 24) show that the primary variation of this variable was among the sites within each group (i.e. through time) as opposed to between the two groups.

Lip Thickness Format 2, on the other hand, showed a strong degree of Single-link clustering (Figure 79). In order to determine if this strong clustering had any relationship with differences in pot size, Goodman and Kruskal's tau measure of strength association was calculated for all pairs of the essential metric variables (Tables 263 and 264). The values for Lip Thickness and Diameter were not consistently higher than those for the other pairs in any of the samples, thus demonstrating a low degree of correlation between these two attribute variables. These tau values indicated, therefore, that there was no strong relationship between the variation in Lip Thickness and differing sizes of pots.

This examination indicated that it was unlikely that the distinctions between the two groups could be attributed to differing site functions. In fact, as indicated by Tables 246 and 247, the

Table 263: Goodman and Kruskal's Tau Values for Metric Attributes (Format 1)

VARIABLES	TAU VALUES All Sites	Group 1	Group 2
Col. Ht. + Lip Thick.	0.0380	0.0852	0.0487
Col. Ht. + Col. Base Thick.	0.0501	0.0928	0.0614
Col. Ht. + Diameter	0.0849	0.1977	0.1095
Lip Thick. + Col. Base Thick.	0.0495	0.0674	0.0559
Lip Thick. + Diameter	0.0597	0.0884	0.0854
Col. Base Thick. + Diameter	0.0694	0.1414	0.0914

Table 264: Goodman and Kruskal's Tau Values for Metric Attributes (Format 2)

VARIABLES	TAU VALUES All Sites	Group 1	Group 2
Col. Ht. + Lip Thick.	0.0272	0.0492	0.0359
Col. Ht. + Col. Base Thick.	0.0841	0.1048	0.0884
Col. Ht. + Diameter	0.0316	0.0652	0.0405
Lip Thick. + Col. Base Thick.	0.1184	0.1128	0.1255
Lip Thick. + Diameter	0.0602	0.0486	0.0809
Col. Base Thick. + Diameter	0.1285	0.1139	0.1476

variables that most consistently indicated differences between the two groups were those of decoration, for which no functional interpretation has been advanced. It was necessary, then, to proceed to the social level of inference.

5.3.5 Society

At the social level inference, the nature of the societies

represented by the sites in the sample was examined in light of inferences and assumptions concerning spatial, temporal, and functional relationships formulated and evaluated in previous sections. As at the lower levels of inference, a number of hypotheses were posited and evaluated. To begin with, any proposal based on an assumption of random association of different communities with no relationship to each other was rejected outright on the basis that too strong a degree of clustering was already evident from analysis at lower levels of inference. In other words, it was assumed from the outset that there was some form of social relationship among the sites in the study area, since a scenario of unrelated communities moving in and out of the area would have produced a high degree of randomness of variation among the analytical entities and such randomness was certainly not evident.

Two alternative social hypotheses were proposed to account for the variation evident in the ceramics. One of these posited that the spatial cluster of sites in Group 1 in the Crawford Lake locale represented the village stations of one community that relocated itself within the confines of a limited space. The Group 2 sites, because of their comparatively widespread (or non-clustered) spatial distribution, were hypothesized to represent more than one community. If this were the case, it would be expected that the variation evident in the Group 1 ceramics would demonstrate a much greater internal consistency than that of the Group 2 ceramics. The other hypothesis was generated from the model developed in Chapter 4.0. This proposed that the two groups of sites represented two, and only two communities relocating through time, with the Group 1 community limiting the distance of removal, whereas the Group 2 community did not. The prediction in this case would be that

both groups of sites would exhibit similar degrees of consistency in ceramic variation. The first problem of this section, then, can be restated simply as an attempt to determine the number of communities represented by the sites in the study area. The second problem was to determine the relationship between the communities.

In order to pursue this problem the degree of clustering among the sites as displayed by the dendrograms in Figures 58 to 135 was examined in greater detail. These diagrams display not only degree of clustering between the two groups of sites, but also the consistency of the relationships of the sites in each group. Of particular interest were those variables that produced dendrograms labelled with the 'plus' (+) symbol in Tables 246 and 247. These variables were those that not only displayed separation into at least one group of sites on the basis of Double-link clustering, but also showed distinct clusters based on the Single-link approach. These were considered socially essential variables. To these attribute variables can also be added Emerson's pipe types, the dendrogram for which is presented in Figure 11.

Of the attribute variables, fifteen showed some degree of clustering among at least one of the groups of sites defined so far in this study. Those marked G2+ showed a Double-link separation of Group 2 sites only, with the sites in Group 2 being strongly clustered (e.g. Figure 128). No variable demonstrated a similar pattern for the Group 1 sites. Those marked B-(2+) showed a Double-link separation of both groups of sites, with the Group 2 sites having the stronger Single-link cluster. Only one variable, that marked B-(1+) showed the same pattern for Group 1. The five variables marked B+ produced dendrograms in which both groups were strongly clustered. These latter five variables were considered to display variation that could be judged key at the social

level.

It was immediately apparent that the pattern of variation predicted by the first hypothesis set out above, proposing that more than one community was represented by the Group 2 sites, was not evident in this data. In fact, most of the variables identified as socially essential demonstrated patterns in which the Group 2 sites were more highly clustered than the Group 1 sites. The strongest of these were those variables marked G2+, for which the pattern was opposite to that predicted by the first hypothesis; in these variables, the Group 2 sites were strongly clustered whereas the Group 1 sites were not clustered at all. Most illuminating, however, were those five variables considered to be socially key. By definition, these variables showed clustering internal to both groups and distinction between them. It was considered significant that the degree of internal clustering for the groups demonstrated by these variables was relatively similar. Only in the case of Upper Rim Motif Format 4 (Figure 102) and Format 5 (Figure 108) was the internal consistency of Group 1 greater than that for Group 2. In this case, however, it was noted that the dendrograms for these two variables are very similar to that for the attribute combination judged to be highly significant temporally above (compare to Figure 136). Because of this, it was quite possible that the pattern of clustering evident for Upper Rim Motif Formats 4 and 5 was skewed by temporal change.

The pattern discussed above militated against the acceptance of the first hypothesis outlined above, and supported the second, proposing only two communities relocating their village sites in the study area. Because of this, the distinction apparent between the pipe assemblages

from the Group 1 and Group 2 sites respectively remained anomalous and unexplained. In order to pursue an explanation of this anomaly, it was necessary to proceed to the last level of inference, that pertaining to culture and symbolism. It was at this point that the examination of analytical entities was merged directly with the model proposed in the preceding chapter. It was hypothesized that the anomaly in the pipes could be explained only in terms of symbolic differences for reasons that were discussed in Chapter 4.0. In the final chapter, the model will be evaluated in light of the patterns identified here using analytical entities.

Chapter 6.0

Summary and Conclusions

In this final chapter, the objectives of the dissertation will be reviewed and the attempts to satisfy them discussed. Since a distinction between methodological and theoretical aspects of archaeology, each with its own precepts and assumptions, has been posited and followed in this study, the conclusions will be formulated in the same terms. In other words, we can now evaluate both the theoretical model proposed and the approach to the ceramic data used here, as well as their ramifications for Iroquoian archaeology.

Both the model proposed in Chapter 4.0 and the examination of analytical entities pursued in Chapter 5.0 were purposely developed within the framework of levels of inference so that they could be compared to each other systematically. The procedure of comparison adopted here was to map the hypotheses posed to explain the variation in the analytical entities onto expectations of variation that could be predicted using the model. A good example of this comparison is provided by the hypotheses generated at the level of space. In the examination of pattern exhibited by the analytical entities two hypotheses were initially posited. One of these predicted no match between analytical variation and spatial variation and the other attempted to predict the pattern of variation as if it were directly influenced by space. In this case the mapping procedure was quite straightforward, because the pattern of variation in the analytical entities could be compared directly to the spatial distribution of the sites. Since the pattern demonstrated by the variables mapped well with the spatial arrangement of the Group 1 sites, but not Group 2, both the

notion of direct spatial variation as well as its corollary, that of no variation coincident with space, were rejected. A third hypothesis stated simply that the emergent pattern was anomalous, if considered only at the spatial level. This can be developed somewhat further if the spatial expectations of the theoretical model are included. According to this model, there were two separate and autonomous, but contemporaneous communities occupying the study area. The spatial aspect of this model states that one of these communities chose to limit its relocation of village site within the prescribed area of the Crawford Lake locale, while the other relocated in a much less constrained manner within the study area. The prediction of spatial variation (meaning variation in general, not just in the ceramics) that comes from this model is that there would be some degree of consistent difference between the two groups of sites, but also recognizable similarities between the two groups. This pattern was borne out quite strongly by the variation evident in the rim section variables, and to a lesser degree by the bowl section variables. There are, however, other scenarios that could be postulated to explain this spatial pattern. These are discussed below.

Firstly, the same sort of pattern could emerge if the two groups of sites were not contemporaneous but were separated in time by a short period either for which no representative sites were available for study in this dissertation or during which rapid change in artifact form occurred. Because of this it was vital to determine the temporal relationships among the sites. Since the theoretical model proposed that the two groups of sites were, at least to some degree, contemporaneous, it was predicted that the expected pattern of variation would be regular change that could be recognized in both groups of

sites, and which would be of significant complexity so as not to be considered accidental. Upon detailed examination of the analytical entities, such a pattern was discovered in the rim section variables relating to external decoration. The pattern evident in these variables, and especially in a combination of variables, indicated that there not only was smooth temporal change among the sites within each group but also significant overlap between the two groups. This evidence of overlap indicates that the sites being studied were representative of at least two separate and partially contemporaneous groups. The chronological aspect suggested by the theoretical model proposed in Chapter 4.0 is, therefore, also supported by a mapping of predictions from this model onto the pattern that emerged in the study described in Chapter 5.0.

A second scenario was that certain economic relationships between the two groups of sites could have produced a pattern similar to that demonstrated by the analytic variables. For example, if one of the two communities was not autonomous, but was in some manner an economic subset of the other, certain differences in pattern would be expected between the groups of sites. To date, the only form of such pervasive difference that has been suggested by archaeological, ethnohistorical, or analogical data for Iroquoian societies is the special purpose site (see Williamson 1983; Jamieson 1982; Pearce 1984). Such sites were apparently seasonal stations occupied by groups of people from main settlements for various purposes such as cultivation, faunal resource processing, and fishing. There is no evidence that semi-permanent subsidiary sites, such as the peasant villages of more complex societies, existed in Iroquoian society. As noted in Chapter 4.0,

however, there are no pervasive differences among any of the sites that could said to match the indices proposed by Williamson (1983) to identify special purpose sites. For example, all of the sites appear to be at least one hectare in size, in contrast to the Crawford Lake II site, a very small cabin site also located in the Crawford Lake locale, and to the special purpose sites surrounding the Lawson site (Pearce 1984). All of the sites described here had several large midden deposits and produced relatively significant amounts of ceramic material, also in contrast to Crawford Lake II and the Lawson hamlets.

In addition, the examination of ceramic variables that could be related directly or indirectly to artifact function conducted in Chapter 5.0 provided no indication of significant variation in pot or pipe function between the Group 1 and Group 2 sites, of the sort that would be expected if there were pervasive economic differences between the two groups. This does not, of course, eliminate the possibility of functional variation in other artifact classes that might more closely reflect differing economic activities that could have occurred on the sites under study. In fact, the economic aspect of the theoretical model predicts that certain differences in chipped lithic artifacts related to the processing of faunal resources, especially deer, and in the faunal remains themselves, should be evident in the artifact samples from the sites. Examination of such artifact classes was beyond the scope of this study. Yet, as noted in Chapter 4.0, preliminary study of the faunal remains shows that deer makes up a much larger proportion of the unworked bone recovered from the sites in the Crawford Lake locale than it does in the other sites. There is no evidence to indicate that the sites in the sample were not economically autonomous or that the patterns evident in the analytical entities can be attributed to

pervasive economic differences between the two groups of sites.

A third scenario that would influence the nature of pattern in artifact variation can be posited at the social level of inference. It is necessary to consider predictions of variability among the sites that would arise from a social context if our model holds true and to compare such predictions to the patterns evident in the analytic entities. So far in the mapping of models to analytical patterns it has been important to assume that there were at least two communities represented by the sites in the study area. At the social level it is necessary that it be determined that no more than two communities occupied this area. The possibility that more than two communities were present was approached directly in the examination of analytical variables in the preceding chapter and no evidence was discovered that supported this possibility. We can now go further and argue that the pattern that emerged from the analytical examination supports the prediction of socially significant variability generated from the theoretical model.

The model postulated that the sites used in this study represent some, but certainly not all, of the stations of two communities that occupied the research area at the same time. It was proposed that although they were economically and socially autonomous, these two communities interacted in some fashion, probably not hostilely. A prediction of pattern arising from the social aspects of this model is that variation between the two communities would be similar with some minor distinctions, and, more importantly, both the similarities and distinctions would be maintained in a pattern of evolution through time. This is exactly the pattern that emerged through examination of the rim section variables, especially those of external vessel decorative motif.

As noted in Chapter 5.0, however, a strongly different pattern emerged for some of the bowl section variables. This pattern indicated a strong degree of difference between the pipe assemblages from the two groups of sites. This pattern was treated throughout the examination of analytical variation as a formal anomaly that could not be explained at any of the levels of inference from space to society. A theoretical explanation was proposed to deal with this anomaly at the the cultural level of inference. This hypothesis stated that, although the two communities were interacting autonomous social units, some social difference existed between them that was symbolized at the cultural level by the distinction in the styles of pipes. In order to identify and account for the social difference thus postulated, recourse was made to the possibility of non-pervasive economic differences between the two communities surfacing as tensions stemming from competition over a scarce faunal resource, namely deer, focusing on the Crawford Lake locale. This hypothesis is supported by the anomaly of the pipes, since both exploitation of faunal resources and pipe manufacture are identified through ethnohistorical analogy as male activities. The proposed explanation for the anomaly in the bowl section attribute variation, therefore, is that the distinctions were stylistic and reflected the differences in access to a scarce resource.

This conclusion offers a cultural explanation of a formal anomaly that takes into account the environmental distinctiveness of the Crawford Lake locale, the proposed spatial and temporal distributions of the sites, and the variation in the artifacts associated with economic and social pattern. It is supported by comparing, through levels of inference, the pattern discovered by investigation of the analytical entities with that predicted by the theoretical model. There are,

however, a number of aspects of this explanatory model that will require further research to expand and clarify. They include the actual symbolic nature of the pipe styles, the ways in which this pattern of meaning arose, and the operation of the symbolism within a social context. In order for these questions to be pursued, the broader issue of the nature of the social interaction between the communities studied in this thesis, and among Middle Ontario Iroquoian Stage communities in general, must be examined in some detail. This is especially so considering the widespread distribution of the distinction in pipe styles across southwestern and southcentral Ontario that was pointed out in Chapter 4.0. This distinction seems to rule out the possibility that there was widespread trade in pipes in Ontario during Middleport times, as appears to have taken place in the Mohawk Valley at a later date (Kuhn 1986). It also decreases the probability that the stylistic anomaly in the Crawford Lake area came about as a result of one or both of the communities being in social isolation from other Iroquoian groups in Ontario.

We can now consider a major methodological issue that is raised by the present research. This concerns the nature of the analytical entities employed for the archaeological study of Iroquoian societies using ceramic artifacts. As has already been noted several times, a debate has taken place concerning the value of MacNeish's pottery typology or attribute values for the analysis of Iroquoian pottery. The results of this study indicate that a form of compromise between the two is necessary. There is no question that MacNeish's types, because they are largely intuitive, do not systematically illuminate the statistical behaviour of attribute values or variables. This makes it impossible to

isolate individual patterns of variation that can be interpreted as meaningful at any separate level of inference. It can also be seen, however, that, in temporal terms, MacNeish's types were very useful for providing a working seriation of the sites under investigation in this study. In fact, the linear arrangement of sites using MacNeish's types as seriation entities duplicated the compromise chronological order generated using individual attribute variables. It differed from the order seriated using attribute combinations only in terms of the ordering of the Rife and Unick sites. This strongly indicates that MacNeish's typology inherently demonstrates at least some chronological significance. This contention is further supported by the fact that the attribute combination producing the order here considered to be the most significant temporally was based on a systematic treatment of the same attributes that MacNeish employed intuitively. This observation does not discredit the criticisms of MacNeish's typology made by White, Wright, and Ramsden, however, and in my opinion MacNeish's types remain unsatisfactory analytical entities for purposes other than preliminary inference involving the physical entities of archaeology.

If we review the wide range of patterns of variation that is clearly demonstrated in the many tables and histograms presented in this dissertation, it becomes possible to question seriously the other side of the longstanding methodological debate in Iroquoian archaeological research. This argument proposes that examination of the individual values of attribute variables in isolation from context is the most productive means of analyzing Iroquoian ceramics. That process has been dubbed 'attribute analysis', which is unfortunate in my view, because it only begins to consider the potential of ceramic attributes. This contention is supported by a close inspection of the pattern of

variation in a variable such as Upper Rim Motif, presented as Format 3 in Tables 104 and 105, and illustrated by histogram in Figure 33. The pattern demonstrated by the values of this variable is apparent only if all of the values are considered in context, as in Figure 33. If we examine the variability of single values the reason for this becomes clear. The statistical behaviour of the values 'BAA' (non-horizontal motif) and 'BAB' (horizontal motif) serve as a good example. If we take all of the sites into account, and assume the chronological order of sites proposed here, the frequencies of neither of these values, when considered separately, vary in a regular fashion through time. If we note the frequencies of these values in comparison to each other, however, a very clear, regular pattern emerges of 'BAB' decreasing through time in relation to 'BAA', irregardless of the frequencies of the individual values. An even more complex and instructive variation on this theme can be presented if we consider the variation evident in the variable Neck Motif. When studied individually, the values of this variable demonstrate very little pattern through either space or time. It was only when these values were combined with the values of other variables that a clear temporal pattern emerged. In other words, the variation of the variable Neck Motif only became meaningful in temporal terms when it was considered in conjunction with Upper Rim Motif. Such patterning cannot be predicted before a detailed examination of attribute variation is conducted for the sample being studied. In fact, if the values of the variables are examined in isolation from each other, inference of either spatial or temporal patterns would be quite different from those that emerge if they are considered together at various levels. The point of this argument is, therefore, that not only

can valuable information be ignored if individual attribute values are considered the most valuable analytical entity, but the patterns postulated on the basis of single values can be misleading.

An even more complex pattern can be seen if we consider the patterns of variation indicated by the same variables considered above when examined within the context of a framework of level of inference. As noted in Chapter 5.0, even though the variable Upper Rim Motif Format 3 and variable of attribute combinations (Rim Form + Upper Rim Motif Format 3 + Neck Motif Format 6) were considered to display pattern that was significant chronologically, the divergence evident at the spatial level of inference was still recognizable. This serves to demonstrate the extremely important point that the variability exhibited by one variable may show more than one pattern. These different patterns can, and indeed must, be examined for significance and meaning at varying levels of inference or their value will be lost. This is, of course, a further argument against limiting investigation to individual attribute states.

At this point we can review the methodological framework of levels of inference. As with all analytical studies, the objective of this thesis has been to discover meaningful pattern within what may seem to be a bewildering array of variation. This goal can be operationally defined as the isolation of essential and key similarities and differences from the 'noise' of less essential and inessential variation. In order to accomplish this it is necessary not only to select appropriate variation at the level of form, but also to justify the selection by specifying how it is meaningful in terms of space, time, economy, society, or culture. The course adopted in this study has been to consider a number of alternative hypotheses at successively

more complex levels of inference. Structuring the analysis within the context of this hierarchy of inference allowed prior probabilities to be established, as suggested by Salmon and discussed in Chapter 3.0, for the various hypotheses at each level. These hypotheses could then be tested by comparing the prediction of patterned variation for each case to that demonstrated by the analytical entities. This procedure thus becomes a methodological means not only of organizing hypotheses, but also of establishing which are the most useful and probable in a manner which is 'data informed'.

It remains to discuss the theoretical ramifications of this research by examining some general problems arising from the nature of the pattern discovered in the analytical variables for both rim and bowl sections. One such problem is the question of the antecedents of the social distinction in pipe styles proposed in our model. Unfortunately, adequate artifact samples have not been recovered from a number of the sites located in the study area. These include components such as South Track and Laurensen, judged on the basis of a preliminary examination of the rim sherds to be earlier in time than the sites employed in this dissertation. Only from the Bennett site has a significant amount of data been recovered. Because of this, detailed comparisons of data from the earlier sites and the Group 1 and 2 sites were not feasible in this study, although some general comments can be made. Wright (1966, 55) proposed that the assemblages of pipes recovered from Middleport sites represented a pipe complex that had been adopted or imported suddenly and fully developed from the ancestors of the historic Onondaga, Oneida, and Mohawk, with whom they were in close contact. He stated further:

> That the pipe complex was adopted suddenly and completely is supported by its homogeneity in the

> Middleport substage, by the absence of a transitional developmental stage of the pipe complex, and by the evidence that the remainder of the Middleport archaeological assemblage is demonstrably evolved directly out of the preceding Uren substage (Wright 1966, 63).

In light of the evidence of distinction between communities presented here, the homogeneity of the Middleport pipe complex can be questioned. This observation does not, however, explain the origins of either the pipe complex or the stylistic anomaly. Implicit in Wright's suggestion that the pipe complex was imported is the notion that the origin of the relatively complex Middleport pipe styles lay in external social relations; that is, it was caused by the close social contact that Wright argues Middleport peoples in present day Ontario had with Iroquoian groups in present day New York State. It has been argued in this study, on the other hand, that the distinction between the two sets of styles in the study area reflect local economic, social, and cultural factors. Although this argument does not discount the possibility that pipe styles were introduced from outside the study area, it allows the following tentative suggestions to be made. It follows from the model proposed here that, if the stylistic anomaly can be attributed to internal factors, then, by inference, so can the context within which the pipe styles, and any differences among them, arose. In other words, it is argued that the economic and social conditions that led to the cultural expression demonstrated by the pipe styles evident here developed at the same time as the introduction of the pipe complex, and, further, were responsible for this so-called florescence. I say so-called because the development of the Middleport pipe complex must be viewed in relative terms. The pipe data available for sites in the study area support Wright's contention that the pipe styles increased

in stylistic complexity relatively abruptly; the photographs of pipes in Wright's and Anderson's monograph on the Bennett site (1969) can be compared with the pipes illustrated in Wintemberg's report on the Middleport site (1948) which illustrates pipes that are typical of the Group 1 sites in the study area. In terms of the methodological paradigm presented in this dissertation this can be regarded as an anomaly at the temporal level of inference. On the other hand, it can be suggested that the difference between the pipes recovered from the Bennett site and later Middleport sites is no greater than that between the two communities argued for in this study. Wright describes the Early Ontario Iroquois Stage pipes as crude (1966, 63). A different viewpoint may be proposed if we consider the pipes within the context of levels of inference. The Bennett pipes can be regarded as 'crude' only if one proceeds directly from the inferential level of form directly to that of culture, or in other words, if we jump from form to style without considering other levels of inference. Although this contention must be supported by detailed analysis before it can be considered a strong argument, it can be suggested that if the pipe forms are considered functionally the supposed temporal anomaly is much less pronounced. In order to explain this temporal anomaly, I offer the following tentative alternative hypothesis. The complexity and disparity in the pipe styles did not arise simply because of outside influence, an influence that has not been accounted for in any case. It occurred as a cultural reflection of tensions that developed in the local area. The inspiration for the pipe styles that became popular may have come from the ancestors of the League of Five Nations, but the impetus for the introduction of the Middleport pipe complex did not.

Another problem that can be considered here is the question of the

transition from Middleport to the prehistoric precursors of the later historic Iroquoian confederacies that was introduced in Chapter 4.0. According to Wright's framework of the Ontario Iroquois Tradition the sites studied here straddle the boundary between the Middle Ontario Iroquois Stage (Middleport) and Late Ontario Iroquois Stage (prehistoric Neutral). It was argued in Chapter 4.0 that Wright implied this transition was due to internal factors of divergence. Using the patterns of variation that emerged in this dissertation, some observations can be made on this transition. The trends of change in evidence for the rim section variables do not support any interpretation of a temporal anomaly occurring within the study area during the time of occupation by the communities from which the sites under study resulted. The nature of variation demonstrated by the variables considered to be most temporally sensitive as well as the variable of attribute combinations indicate that the temporal change was relatively gradual. In other words, no evidence for the introduction of any new internal factors of divergence is shown by the rim section attribute variables. In addition, the divergence demonstrated by the bowl section variables did not emerge as a temporally significant factor, and, indeed, this divergence is clear throughout the time span represented by the sites studied here. The conclusion resulting from the analysis conducted in this study is that internal evidence for the pervasive social and cultural divergence suggested by Wright is lacking in the research area. In fact, the pattern of variation indicates a period of both continuity of pottery styles, and, even more important because it is more complex, continuity in the distinction of pipe styles. What is suggested here, therefore, is that the distinction between Middleport and prehistoric

Neutral in this area may be an analytical construct that is no longer useful; in other words there may be no historical value in defining such a transition. Since this remains, of course, an hypothesis, any attempt at suggesting an alternative terminology will be foregone.

In conclusion, I would like to summarize the arguments forwarded in this dissertation. It has been argued throughout this discourse that a refinement of the methods used as a foundation for research on Iroquoian societies is necessary. A two-tiered methodological model employing physical and analytical entities, and a framework of levels of inference to map the inferences and assumptions generated through a systematic examination of both, has been suggested. As a result of the investigation conducted in this study, it has been argued that some of the theoretical assumptions underlying Iroquoian research need to be refined. It is suggested that both the concepts of Middleport as a homogeneous cultural horizon and of a marked transition from the Middle to Late Ontario Iroquois Stages as argued by Wright are not supported by the ceramic data recovered from sites in the research area.

Finally, it almost goes without saying that further research on the issues raised and testing of the conclusions presented in this dissertation are both vital. An explanation for a particular pattern in a discrete area has been offered and it is now necessary for the broader pattern of variation among smoking pipes from Middleport sites, as described in Chapter 4.0, to be investigated in more detail. This is, however, only one of a series of important problems that can be pursued concerning the nature of Iroquoian society during Middle Ontario Iroquoian Stage times. In fact, it would seem that our understanding of Middleport societies is relatively limited at present. In order to investigate such problems, regional sequences in localized areas other

than that surrounding Crawford Lake need to be intensively studied and compared to one another. In addition, it is necessary that the analytical approaches used for the study of Iroquoian artifacts become more highly developed.

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APPENDIX A

Rim Section Attribute Code

A.1 Variables of Rim Shape

Variable Name	Value Names
Rim Form	1. Collared 2. Collarless 3. Everted Lip
Rim Orientation	1. Vertical 2. Outflaring 3. Insloping
Profile (Interior and Exterior)	1. Straight 2. Concave 3. Extra Concave 4. Convex 5. Extra Convex
Angle of Lip to Interior	1. Acute 2. Right 3. Obtuse
Collar Shape	1. None 2. Poorly Developed 3. Well Developed 4. Highly Developed
Collar Height	1 - 999 mm.
Lip Width	1 - 99 mm.
Collar Base Width	1 - 99 mm.
Diameter at Lip	1 - 999 mm.

A.2 Variables of Rim Decoration

Variable Name	Value Names
NOTE: The values of the following variable have exponentially separated labels so that combinations of values can be recorded without any overlap.	
Decorative Element (Interior, Lip, Upper Rim, Neck and Castellation)	1. Plain 2. Furrow 3. Linear Stamp 4. Punctate 8. Dentated Stamp 16. Spiral Stamp 32. Curved Stamp 64. Notch 128. Rocker Stamp 256. Rocker Dentate Stamp 512. Spiral Impression 1024. Double-furrow 2048. Applique
Decorative Motif (Interior, Lip, Upper Rim, Neck)	(see Appendix C)
Secondary Decoration (Upper Rim and Neck)	(see Appendix C)

Variable Name	Value Names
MacNeish Type	1. Lawson Opposed 2. Lawson Incised 3. Pound Necked 4. Pound Blank 5. Ontario Horizontal 6. Middleport Oblique 7. Middleport Criss-cross 8. Ontario Oblique 9. Uren Noded 10. Iroquoian Linear 11. Uren Corded 12. Uren Dentate 13. Ripley Corded 14. Ripley Plain 15. Niagara Collared 16. Ripley Collared 17. Ripley Triangular 18. Warminster Crossed 19. Sidey Notched 20. Huron Incised 21. Warminster Horizontal 22. Seed Incised 23. Seed Corded 24. Sidey Crossed 25. Black Necked 90. Unknown

APPENDIX B

Ceramic Smoking Pipe Bowl Attribute Code

B.1 Variables of Bowl Shape

Variable Name	Value Names
Bowl Orientation	1. Bulbous 2. Insloping 3. Vertical 4. Outflaring
Profile (Interior and Exterior)	1. Straight 2. Concave 3. Extra Concave 4. Convex 5. Extra Convex
Angle of Lip to Interior	1. Acute 2. Right 3. Obtuse
Bowl Lip Width	1 - 99 mm.

B.2 Variables of Bowl Decoration

Variable Name	Value Names
NOTE: The values of the following variable have exponentially separated labels so that combinations of values can be recorded without any overlap.	
Decorative Element (Interior, Lip, Upper Rim, Neck and Castellation)	1. Plain 2. Furrow 3. Linear Stamp 4. Punctate 8. Dentated Stamp 16. Spiral Stamp 32. Curved Stamp 64. Notch 128. Rocker Stamp 256. Rocker Dentate Stamp 512. Spiral Impression 1024. Double-furrow 2048. Applique
Bowl Motif	(see Appendix C)
Secondary Bowl Decoration	(see Appendix C)

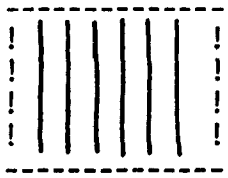
Variable Name	Value Names
Emerson Type	1. Conical Decorated 2. Iroquois Ring 3. Decorated Barrel 4. Elongated Ring 5. Conical Plain 6. Plain Trumpet 7. Snake Effigy 8. Owl Effigy 9. Decorated Trumpet 10. Ring Trumpet 11. Collared Ring 12. Mortice 13. Decorated Vasiform 14. Wolf Effigy 15. Bird Effigy 16. Coronet 17. Decorated Collared 18. Bulbous Ring 19. Bulbous Decorated 20. Capped Human Effigy 21. Roebuck Effigy 22. Pinched-face Human Effigy 23. Apple Bowl Ring 24. Conical Ring 25. Apple Bowl Plain 26. Apple Bowl Decorated 27. Cylindrical Plain 28. Cylindrical Ring 29. Cylindrical Decorated 90. Unknown

APPENDIX C

Decorative Motif Key

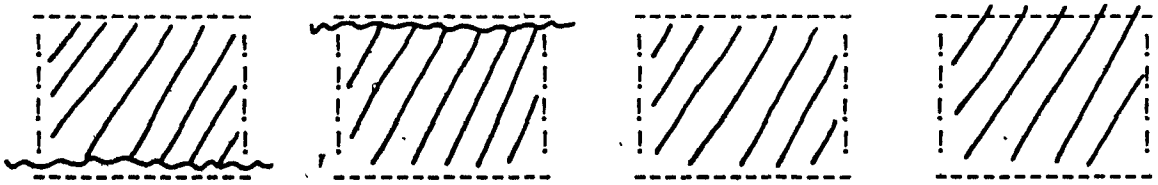
A. PLaiN

B. SIMple | A. LINear | A. Non-HOrizontal | A. VerTicaL



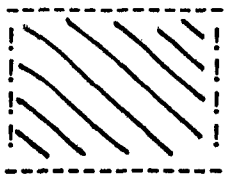
BAAA11

B. SIM | A. LIN | A. NHO | B. OBlique Right



BAAB02 | BAAB03 | BAAB11 | BAAB12

B. SIM | A. LIN | A. NHO | C. OBlique Left



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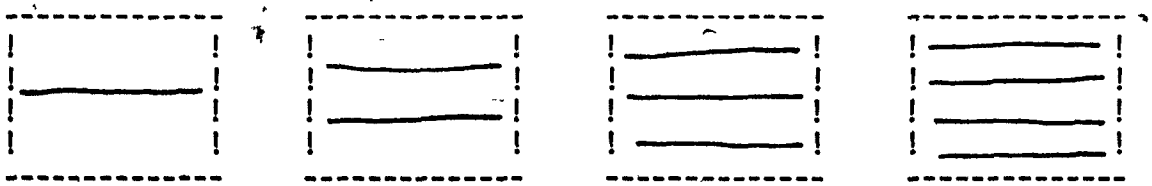
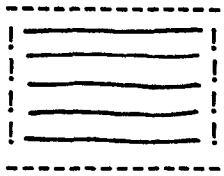
B. SIM | A. LIN | B. HOR | A. HOR



BABA01 | BABA02 | BABA03 | BABA04

B. SIM A. LIN B. HOR A. HOR



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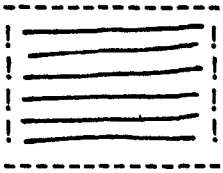

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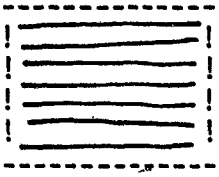

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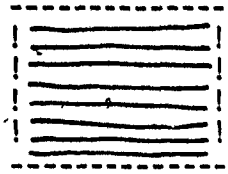
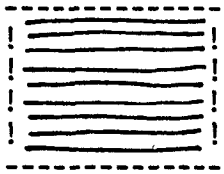


BABA08



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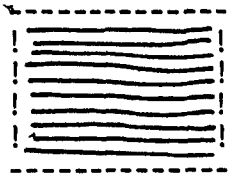

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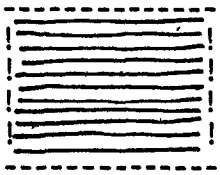
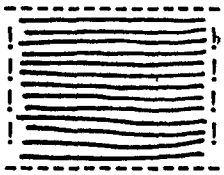


BABA11

BABA12



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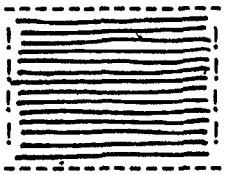

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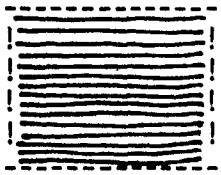

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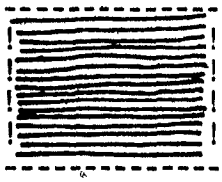

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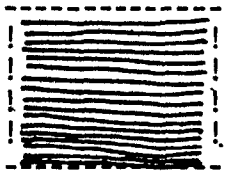

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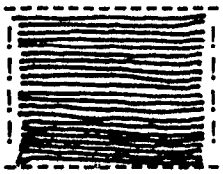
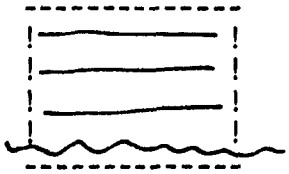
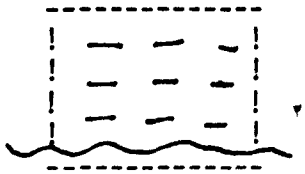


BABA21



BABA92

B. SIM A. LIN C. Linear DAsh B. Linear Dash Even

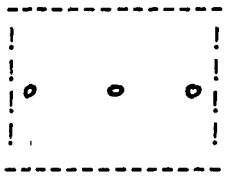


BACB92

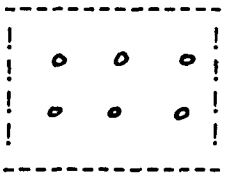
B. SIM A. LIN C. LDA B. Linear Dash Horizontal

BACD01

B. SIM C. PUNctate A. PUnctate Circular C. Puncate Circular Even

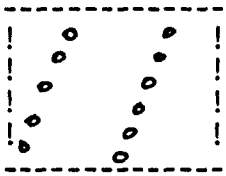


BCAB01



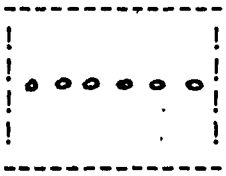
BCAB02

B. SIM C. PUN A. PUC C. Puncate Circular Nonhorizontal



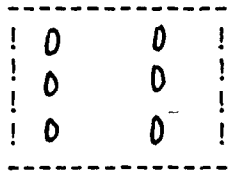
BCAC21

B. SIM C. PUN A. PUC D. Punctate Circular Horizontal



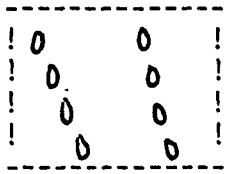
BCAD01

B. SIM



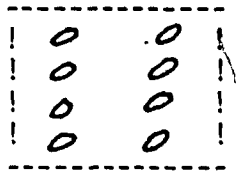
BCBC11

C. PUN



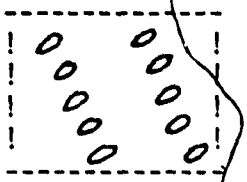
BCBC21

B. PUnctate Elliptical

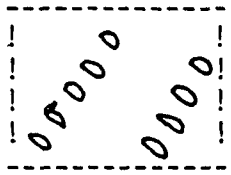


BCBC26

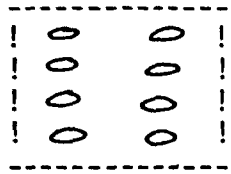
C. Punctate Elliptical Nonhorizontal



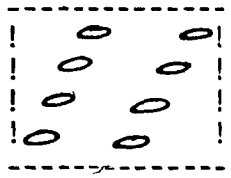
BCBC31



BCBC46

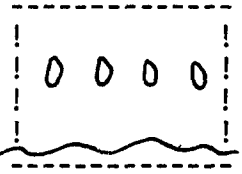


BCBC56



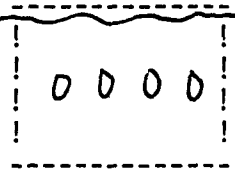
BCBC61

B. SIM



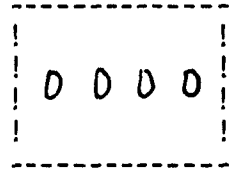
BCBD01

C. PUNctate



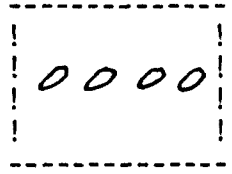
BCBD02

B. PUE

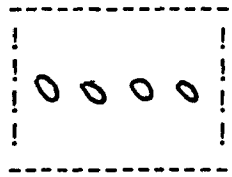


BCBD11

D. Punctate Elliptical Horizontal



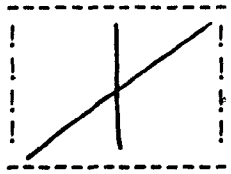
BCBD21



BCBD31

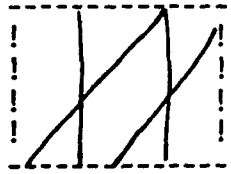
C. Super-ImposeD (x)

A. LIN x LIN



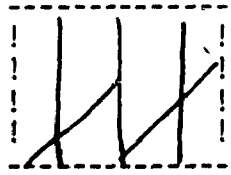
CAAA06

A. NHO x NHO



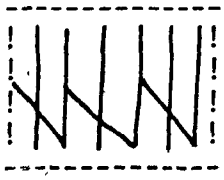
CAAA11

A. VTL x OBR



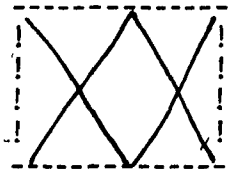
CAAA81

C. SID A. LIN x LIN A. NHO x NHO B. VTL x OBL

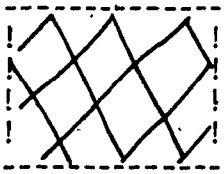


CAAB71

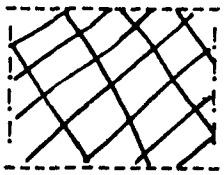
C. SID A. LIN x LIN A. NHO x NHO C. OBR x OBL



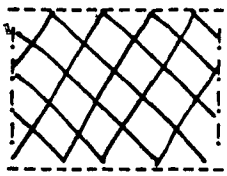
CAAC11



CAAC21

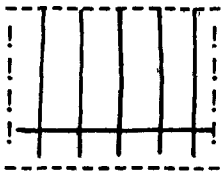


CAAC31



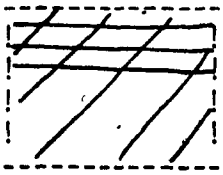
CAAC61

C. SID A. LIN x LIN B. NHO x HOR A. VTL x HOR

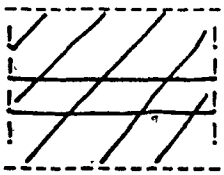


CABA31

C. SID A. LIN x LIN B. NHO x HOR B. OBR x HOR

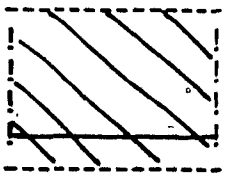


CABB13



CABB22

C. SID A. LIN x LIN B. NHO x HOR C. OBL x HOR



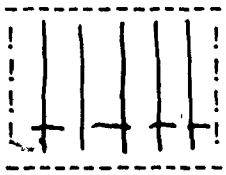
CABC31

C. SID A. LIN x LIN C. NHO x LDA A. VTL x LDR

B. VTL x LDE

C. VTL x LDN

D. VTL x LDH

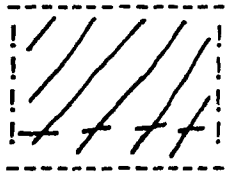


CACD31

C. SID A. LIN x LIN C. NHO x LDA E. OBR x LDR

G. OBR x LDN

H. OBR x LDH



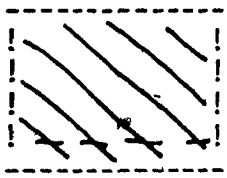
CACH31

C. SID A. LIN x LIN C. NHO x LDA I. OBL x LDR

J. OBL x LDE

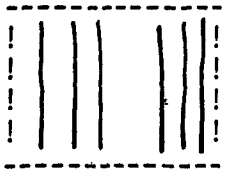
K. OBL x LDN

L. OBL x LDH



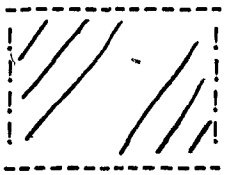
CACL31

D. Horizontal DIfference — A. LIN - LIN Interrupted (-) — A. NHO - NHO — A. VTL - VTL



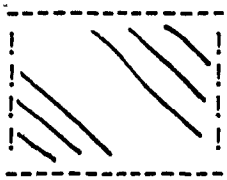
DAAA11

D. HDI — A. LIN - LIN — A. NHO - NHO — B. OBR - OBR



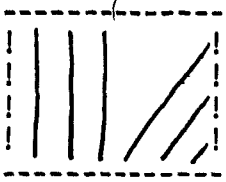
DAAB11

D. HDI — A. LIN - LIN — A. NHO - NHO — C. OBL - OBL

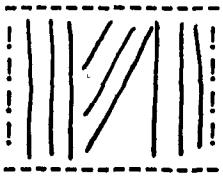


DAAC11

D. HDI — A. LIN - LIN — A. NHO - NHO — D. VTL - OBR

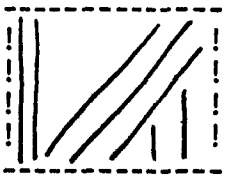


DAAD06



DAAD21

DAAD31



DAAD71

D. HDI — A. LIN - LIN — A. NHO - NHO — E. VTL - OBL

DAAE06

DAAE11

D. HDI

A. LIN - LIN

A. NHO - NHO

F. OBR - OBL

DAAF06

DAAF11

D. HDI

C. PUN - PUN

A. PUC - PUC

B. PUE - PUE

A. PER - PER

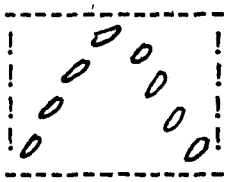
B. PER - PEE

C. PER - PEN

D. PER - PEH

E. PEE - PER

F. PEE - PEE



DCBF11

D. HDI

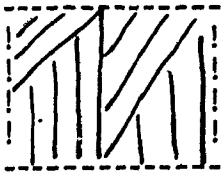
D. LIN / LIN
Opposed (/)

A. NHO / NHO

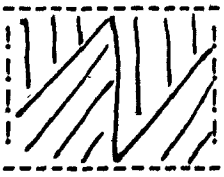
A. VTL / OBR

DDAA06

DDAA07



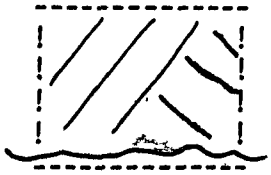
DDAA21



DDAA31

D. HDI D. LIN / LIN A. NHO / NHO B. VTL / OBL

C. OBR / OBL



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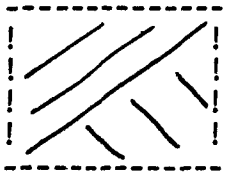

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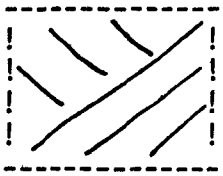

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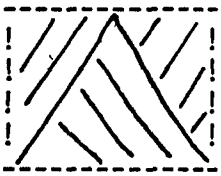
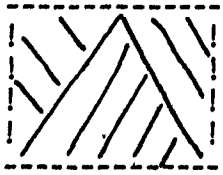


DDAC11



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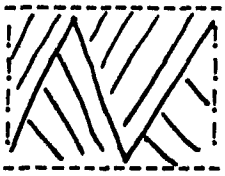

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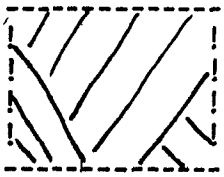

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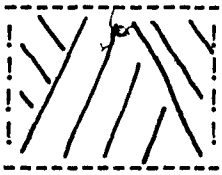
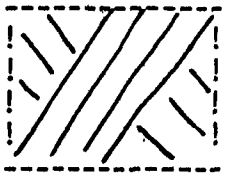


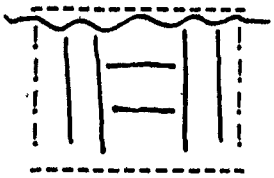
DDAC41



DDAC51

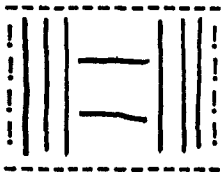
D. HDI D. LIN / LIN A. NHO / NHO D. VTL / OBR / OBL

D. HDI G. LIN ! LIN Combined (!) A. NHO ! HOR A. VTL ! HOR



DGAA03

DGAA11



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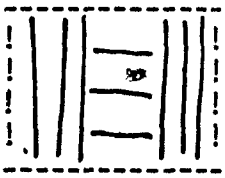
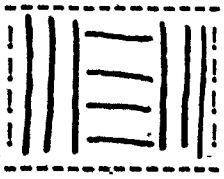
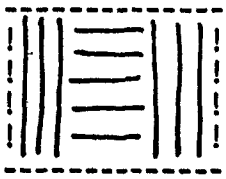


DGAA13

D. HDI G. LIN ! LIN A. NHO ! HOR A. VTL ! HOR



DGAA14



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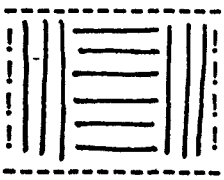

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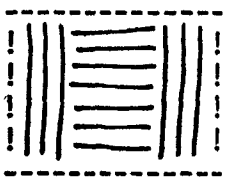
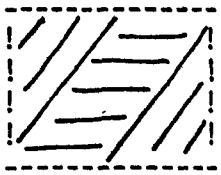


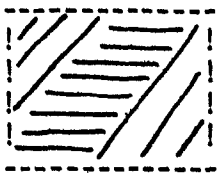
DGAA17

D. HDI G. LIN ! LIN A. NHO ! HOR B. OBR ! HOR

DGAB06

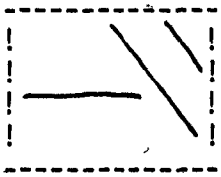


DGAB15

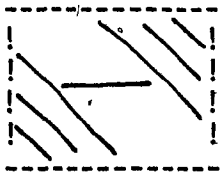


DGAB18

D. HDI G. LIN ! LIN A. NHO ! HOR C. OBL ! HOR

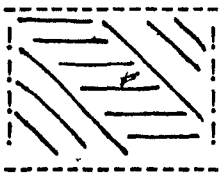


DGAC06



DGAC11

D. HDI G. LIN ! LIN A. NHO ! HOR D. VTL ! OBR ! HOR

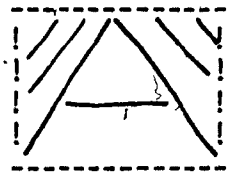


DGAE16

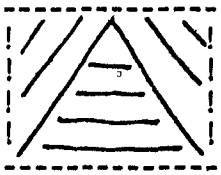
D. HDI G. LIN ! LIN A. NHO ! HOR F. OBR ! OBL ! HOR

DGAF01

DGAF03



DGAF11



DGAF14

D. HDI L. LIN ! PUN H. LDA ! PUE A. LDR ! PER

B. LDR ! PEE

C. LDR ! PEN

D. LDR ! PEH

E. LDE ! PER

D. HDI L. LIN ! PUN H. LDA ! PUE F. LDE ! PEE

G. LDE ! PEN

H. LDE ! PEH

I. LDN ! PER

J. LDN ! PEE

K. LDN ! PEN

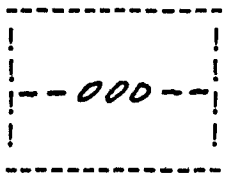
L. LDN ! PEH

M. LDH ! PER

N. LDH ! PEE

O. LDH ! PEN

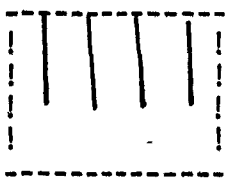
P. LDH ! PEH



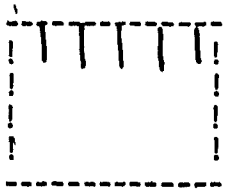
DLHP21

D. HDI S. SIM ! HDI C. HOR NHO/NHO S. HOR OBR / OBL

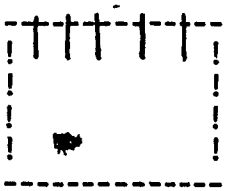
E. Vertical PoSitioning (>) A. LIN > PLN A. NHO > PLN A. VTL > PLN



EAAA11

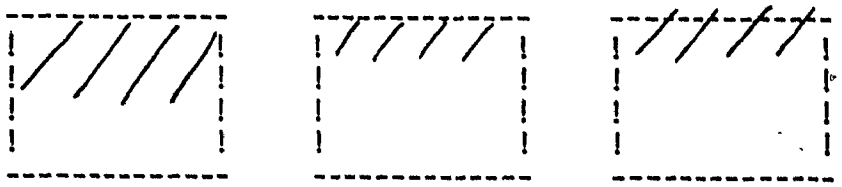


EAAA12



EAAA14

E. VPS A. LIN > PLN A. NHO > PLN B. OBR > PLN

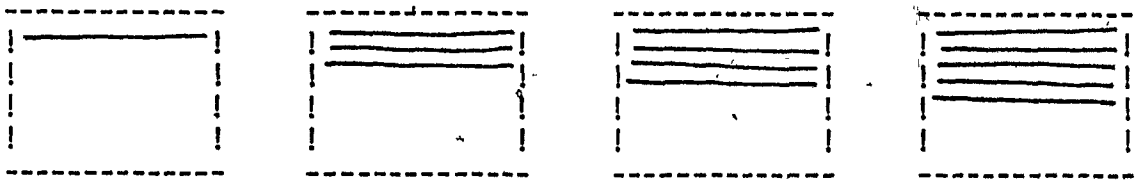


EAAB11 EAAB12 EAAB14

E. VPS A. LIN > PLN A. NHO > PLN C. OBL > PLN

EAAC12

E. VPS A. LIN > PLN B. HOR > PLN A. HOR > PLN



EABA01 EABA03 EABA04 EABA05

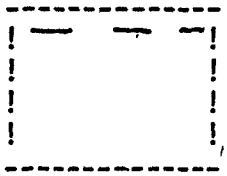
EABA06 EABA12 EABA14

E. VPS A. LIN > PLN C. LDA > PLN A. LDR > PLN

B. LDE > PLN

C. LDN > PLN

E. VPS A. LIN > PLN C. LDA > PLN D. LDH > PLN

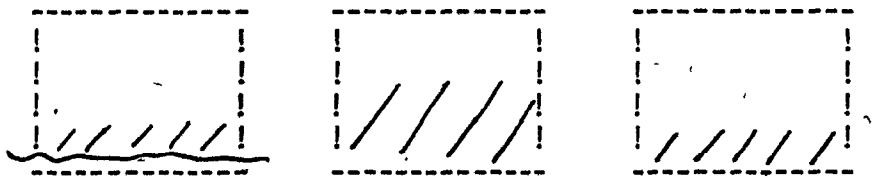


EACD11

E. VPS B. PLN > LIN A. PLN > NHO A. PLN > VTL

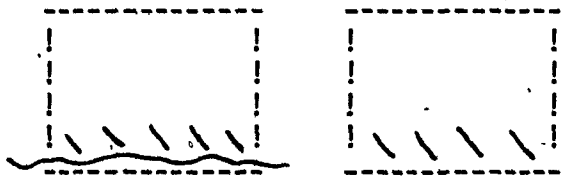
EBAA12

E. VPS B. PLN > LIN A. PLN > NHO B. PLN > OBR



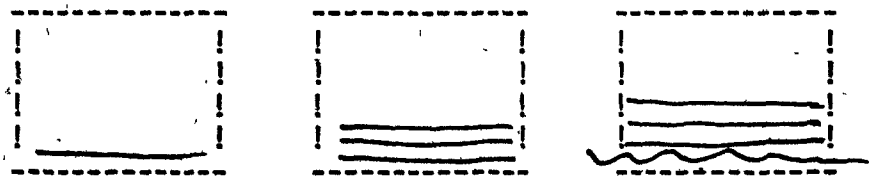
EBAB02 EBAB11 EBAB12

E. VPS B. PLN > LIN A. PLN > NHO C. PLN > OBL



EBAC02 EBAC12

E. VPS B. PLN > LIN B. PLN > HOR A. PLN > HOR



EBBA01 EBBA03 EBBA92

E. VPS B. PLN > LIN C. PLN > LDA A. PLN > LDR

B. PLN > LDE

C. PLN > LDN

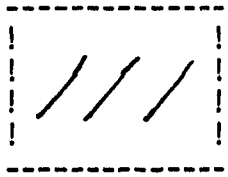
D. PLN > LDH

EBCD11

E. VPS C. PLN>LIN>PLN A. PLN>NHO>PLN A. PLN > VTL > PLN

ECAA11

E. VPS C. PLN>LIN>PLN A. PLN>NHO>PLN B. PLN > OBR > PLN



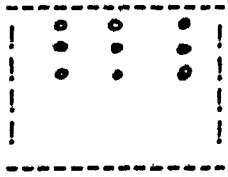
ECAB11

E. VPS C. PLN>LIN>PLN A. PLN>NHO>PLN C. PLN > OBL > PLN

E. VPS G. PUN > PLN A. PUC > PLN A. PCR > PLN

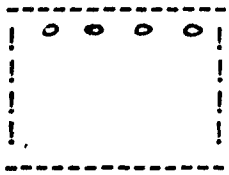
B. PCE > PLN

C. PCN > PLN

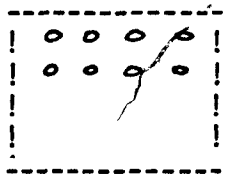


EGAC11

E. VPS G. PUN > PLN A. PUC > PLN D. PCH > PLN



EGAD11



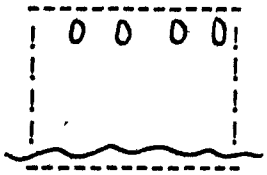
EGAD21

E. VPS G. PUN > PLN B. PUE > PLN A. PER > PLN

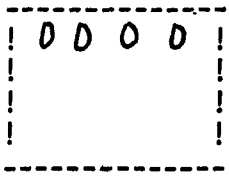
B. PEE > PLN

C. PEN > PLN

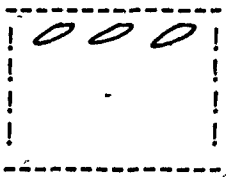
D. PEH > PLN



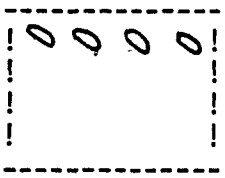
EGBD04



EGBD11



EGBD21



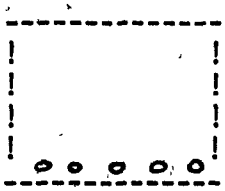
EGBD31

E. VPS H. PLN > PUN A. PLN > PUC A. PLN > PCR

B. PLN > PCE

C. PLN > PCN

E. VPS H. PLN > PUN A. PLN > PUC D. PLN > PCH



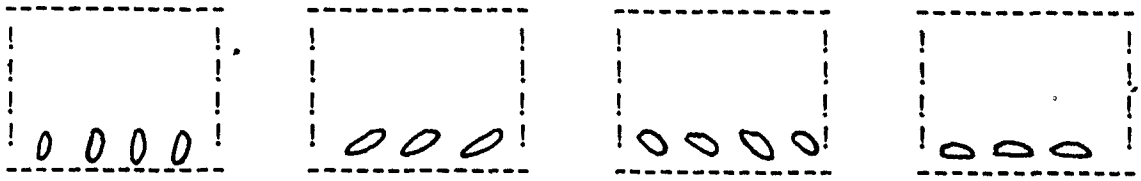
EHAD11

E. VPS H. PLN > PUN B. PLN > PUE A. PLN > PER

B. PLN > PEE

C. PLN > PEN

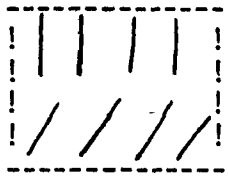
E. VPS H. PLN > PUN B. PLN > PUE D. PLN > PEH



EHBD11 EHBD21 EHBD31 EHBD41

F. Vertical Difference Simple A. LIN > LIN A. NHO > NHO A. VTL > VTL

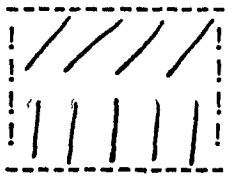
B. VTL > OBR



FAAB01

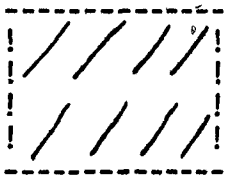
F. VDS A. LIN > LIN A. NHO > NHO C. VTL > OBL

D. OBR > VTL



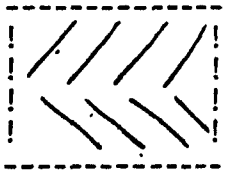
FAAD11

F. VDS A. LIN > LIN A. NHO > NHO E. OBR > OBR



FAAE11

F. VDS A. LIN > LIN A. NHO > NHO F. OBR > OBL

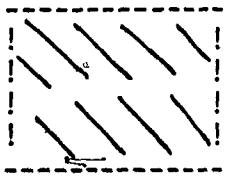


FAAF11

F. VDS A. LIN > LIN A. NHO > NHO G. OBL > VTL

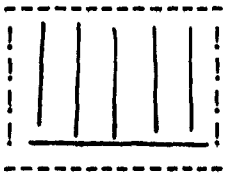
H. OBL > OBR

I. OBL > OBL

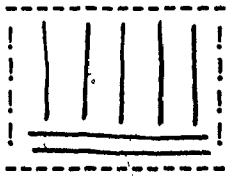


FAAI11

F. VDS A. LIN > LIN B. NHO > HOR A. VTL > HOR



FABA11



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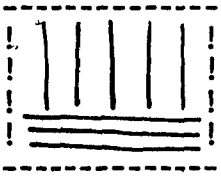
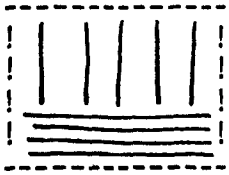
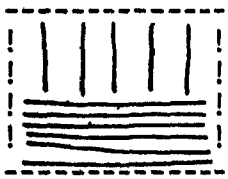


FABA13

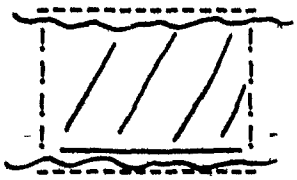


FABA14



FABA16

F. VDS A. LIN > LIN B. NHO > HOR B. OBR > HOR



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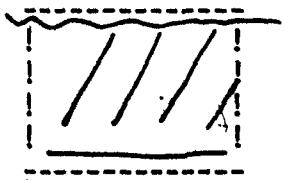

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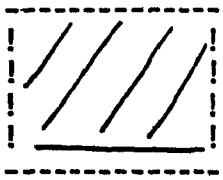

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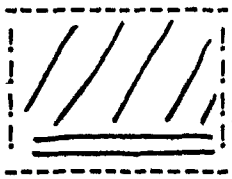
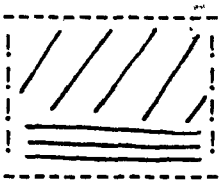


FABB12

F. VDS A. LIN > LIN B. NHO > HOR B. OBR > HOR



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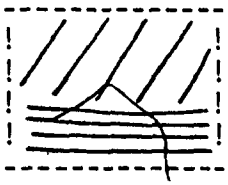
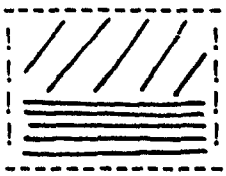
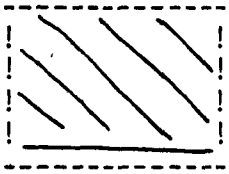


FABB14

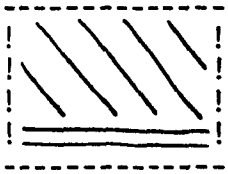


FABB15

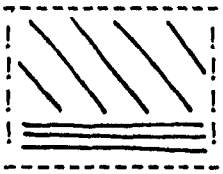
F. VDS A. LIN > LIN B. NHO > HOR C. OBL > HOR



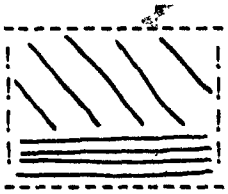
FABC11



FABC12



FABC13



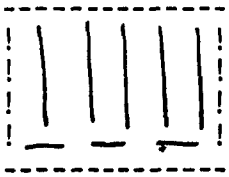
FABC14

F. VDS A. LIN > LIN C. NHO > LDA A. VTL > LDR

B. VTL > LDE

C. VTL > LDN

D. VTL > LDH



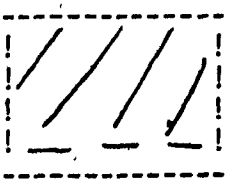
FACD11

F. VDS A. LIN > LIN C. NHO > LDA E. OBR > LDR

F. OBR > LDE

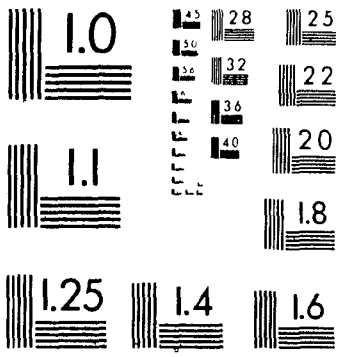
G. OBR > LDN

H. OBR > LDH



FACH11

7 of/de 7



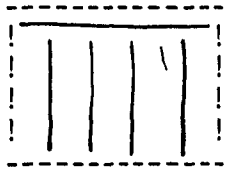
F. VDS A. LIN > LIN C. NHO > LDA I. OBL > LDR

J. OBL > LDE

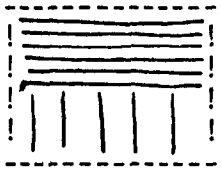
K. OBL > LDN

L. OBL > LDH

F. VDS A. LIN > LIN D. HOR > NHO A. HOR > VTL

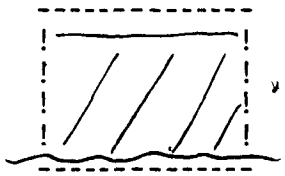


FADA11

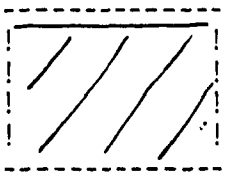


FADA16

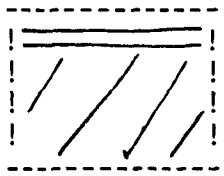
F. VDS A. LIN > LIN D. HOR > NHO B. HOR > OBR



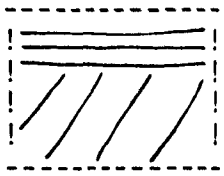
FADB02



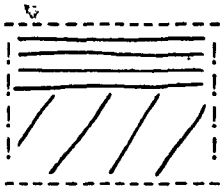
FADB11



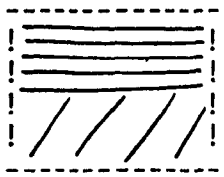
FADB12



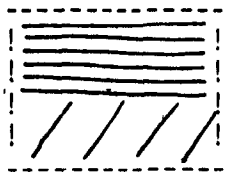
FADB13



FADB14

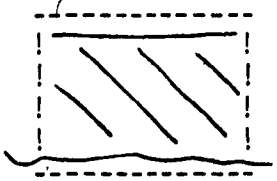


FADB15

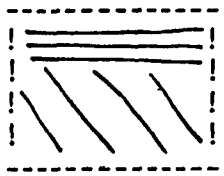


FADB16

F. VDS A. LIN > LIN D. HOR > NHO C. HOR > OBL



FADC02

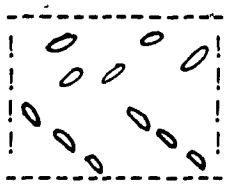


FADC13

F. VDS I. PUN > PUN B. PUE > PUE A. PER > PER

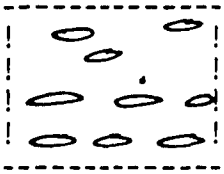
B. PER > PEE

F. VDS I. PUN > PUN B. PUE > PUE C. PER > PEN



FIBC31

F. VDS. I. PUN > PUN B. PUE > PUE D. PER > PEH



FIBD41

F. VDS I. PUN > PUN B. PUE > PUE E. PEE > PER

F. PEE > PEE

G. PEE > PEN

H. PEE > PEH

I. PEN > PER

J. PEN > PEE

K. PEN > PEN

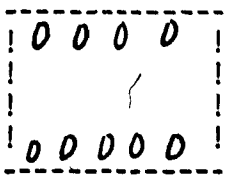
L. PEN > PEH

M. PEH > PER

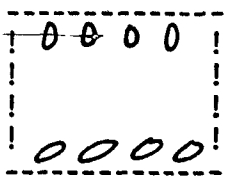
N. PEH > PEE

O. PEH > PEN

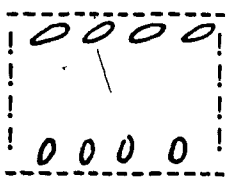
F. VDS I. PUN > PUN B. PUE > PUE P. PEH > PEH



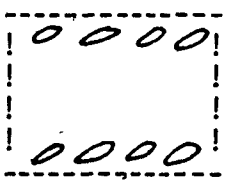
FIBP11



FIBP16

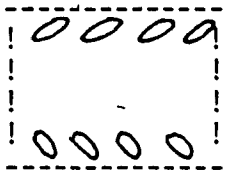


FIBP31

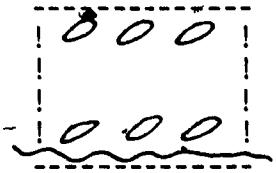


FIBP36

F. VDS I. PUN > PUN B. PUE > PUE P. PEH > PEH

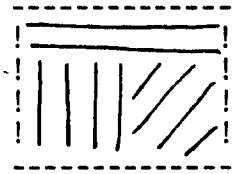


FIBP41



FIBP92

H. SIM > HDI D. LIN>LIN/LIN D.HOR>NHO/NHO A. HOR > VTL / OBR

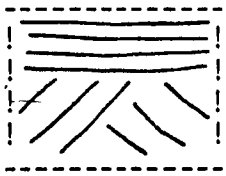


HDDA02

H. SIM > HDI D. LIN>LIN/LIN D.HOR>NHO/NHO B. HOR > VTL / OBL

C. HOR > OBR / OBL

HDDC02



HDDC24

I. SID > SIM A. LINxLIN>LIN A. NHOxNHO>NHO A. VTL x OBR > VTL

B. VTL x OBR > OBR

C. VTL x OBR > OBL

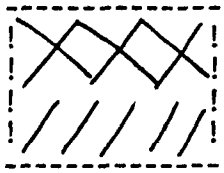
D. VTL x OBL > VTL

E. VTL x OBL > OBR

F. VTL x OBL > OBL

G. OBR x OBL > VTL

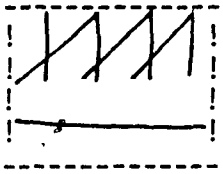
I. SID > SIM A. LINxLIN>LIN A. NHOxNHO>NHO H. OBR x OBL > OBR



IAAH11

I. SID > SIM A. LINxLIN>LIN A. NHOxNHO>NHO I. OBR x OBL > OBL

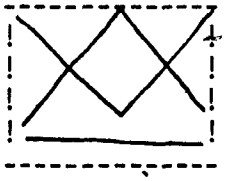
B. NHOxNHO>HOR A. VTL x OBR > HOR



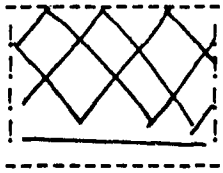
IABA11

I. SID > SIM A. LINxLIN>LIN B. NHOxNHO>HOR B. VTL x OBL > HOR

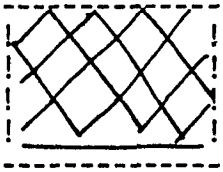
C. OBR x OBL > HOR



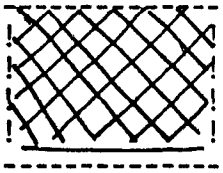
IABC11



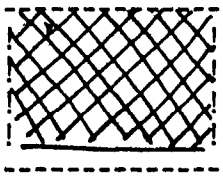
IABC21



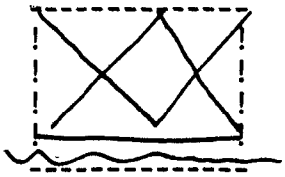
IABC31



IABC61



IABC71

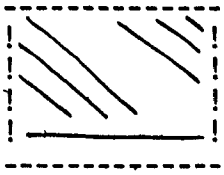


IABC92

L. HDI > SIM A. LIN-LIN>LIN B. NHO-NHO>HOR A. VTL - VTL > HOR

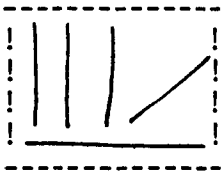
B. OBR - OBR > HOR

L. HDI > SIM A. LIN-LIN>LIN B. NHO-NHO>HOR C. OBL - OBL > HOR

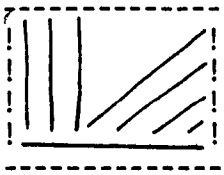


LABC06

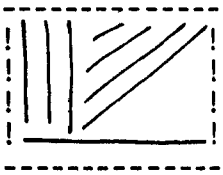
L. HDI > SIM A. LIN-LIN>LIN B. NHO-NHO>HOR D. VTL - OBR > HOR



LABD06

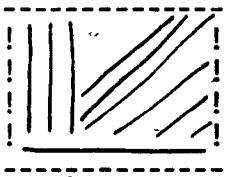


LABD11

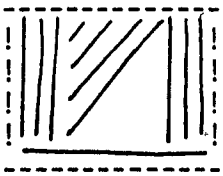


LABD21

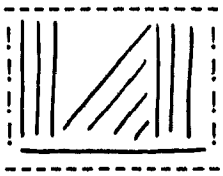
LABD22



LABD31



LABD61

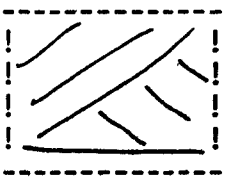


LABD71

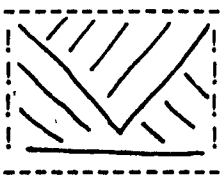
L. HDI > SIM J. LIN/LIN>LIN B. NHO/NHO>HOR A. VTL / OBR > HOR

B. VTL / OBL > HOR

C. OBR / OBL > HOR



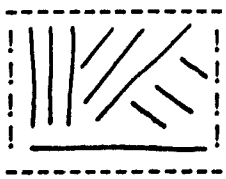
LJBC06



LJBC11

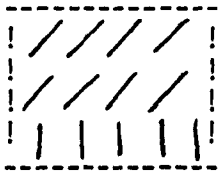
LJBC63

L. HDI > SIM J. LIN/LIN>LIN B. NHO/NHO>HOR D. VTL/OBR/OBL>HOR



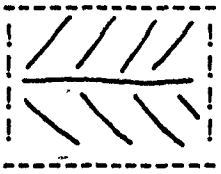
LJBD01

O. SIM SIM SIM	A. LIN LIN LIN	A. NHO NHO NHO	A. VTL	VTL	VTL
			B. VTL	VTL	OBR
			C. VTL	OBR	VTL
			D. OBR	VTL	VTL
			E. VTL	VTL	OBL
			F. VTL	OBL	VTL
			G. OBL	VTL	VTL
			H. OBR	OBR	OBR
			I. OBR	OBR	VTL



OAAI03

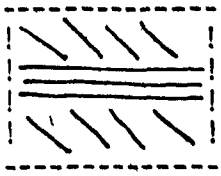
O. SIM SIM SIM	A. LIN LIN LIN	A. NHO NHO NHO	J. OBR	VTL	OBR
		B. NHO NHO HOR			
		C. NHO HOR NHO	A. VTL	HOR	VTL
			B. VTL	HOR	OBR
			C. VTL	HOR	OBL
			D. OBR	HOR	VTL
			E. OBR	HOR	OBR
			F. OBR	HOR	OBL



OACF11

O. SIM SIM SIM	A. LIN LIN LIN	C. NHO HOR NHO	G. OBL	HOR	VTL
			H. OBL	HOR	OBR

O. SIM>SIM>SIM A. LIN>LIN>LIN C. NHO>HOR>NHO I. OBL > HOR > OBL



OACI03