INFORMATION TO USERS

This dissertation was produced from a microfilm copy of the original document. While the most advanced technological means to photograph and reproduce this document have been used, the quality is heavily dependent upon the quality of the original submitted.

The following explanation of techniques is provided to help you understand markings or patterns which may appear on this reproduction.

1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting thru an image and duplicating adjacent pages to insure you complete continuity.

2. When an image on the film is obliterated with a large round black mark, it is an indication that the photographer suspected that the copy may have moved during exposure and thus cause a blurred image. You will find a good image of the page in the adjacent frame.

3. When a map, drawing or chart, etc., was part of the material being photographed the photographer followed a definite method in "sectioning" the material. It is customary to begin photoing at the upper left hand corner of a large sheet and to continue photoing from left to right in equal sections with a small overlap. If necessary, sectioning is continued again – beginning below the first row and continuing on until complete.

4. The majority of users indicate that the textual content is of greatest value, however, a somewhat higher quality reproduction could be made from "photographs" if essential to the understanding of the dissertation. Silver prints of "photographs" may be ordered at additional charge by writing the Order Department, giving the catalog number, title, author and specific pages you wish reproduced.

University Microfilms
300 North Zeeb Road
Ann Arbor, Michigan 48106
A Xerox Education Company
PREHISTORIC LOWLAND MAYA COMMUNITY AND SOCIAL ORGANIZATION: A CASE STUDY

AT DZIBILCHALTUN, YUCATAN, MEXICO

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

Edward Barna Kurjack, B.S., M.A.

The Ohio State University
1971

Approved by

[Signature]
Adviser

Department of Anthropology
ACKNOWLEDGEMENTS

The fieldwork that resulted in this dissertation was supported by the Middle American Research Institute of Tulane University aided by grants from the National Science Foundation, the American Philosophical Society, and the National Geographic Society. During my stay in Mexico I was part of the staff of the Middle American Research Institute's Dzibilchaltun Project. I was in Yucatan collecting data presented here from October of 1962 to September of 1963, December of 1963 to September of 1964, and June through August of 1965. My fieldwork was done under the auspice of the Middle American Research Institute under contract with the Mexican federal government.

This dissertation draws on the work of other members of the staff of the Middle American Research Institute's Dzibilchaltun Project as well as my own. Much of the data used here is presented on the map of Dzibilchaltun. This map was surveyed by four people: George Stuart, John Scheffler, John Cottier, and myself. I rely on Cottier's field notes for the dating of unvaulted structures; he accomplished all of the test excavations mentioned here. Where notes or illustrations compiled by anyone other than myself are used in this dissertation, that fact is acknowledged in the text.
I have often relied on advice and encouragement from E. Wyllys Andrews IV, director of the Dzibilchaltun Project. His vast experience benefited all of us on the project's staff. I am indebted to him for introducing me to the study of Maya prehistory.

Neither Andrews nor the other members of the Dzibilchaltun projects' staff, however, are responsible for any faulty use of the material they helped to compile. The interpretation of the literature, account of the fieldwork, reservations about the data, architectural descriptions, analyses of the field observations, conclusions, and opinions contained in this dissertation are my own and I accept full responsibility for them.

My dissertation adviser, Dr. Thomas Rhys Williams, deserves my appreciation and esteem for his advice and patience. My thanks go to the readers of my dissertation at Ohio State University: Dr. Raymond Baby, Dr. Erika Bourguignon, Dr. S. Earl Brown, Dr. Edwin Hall, Dr. John Messenger, and Dr. Eugene Poirier. Comments and suggestions were received from Dr. E. Wyllys Andrews, Dr. Asael T. Hansen, Dr. Robert Wauchope, Dr. Richard Krause, and Professor Alfredo Barrera Vásquez; I deeply appreciate their help. I would also like to express my thanks to the personnel at the Miami University Computer Center for the cheerful attention they paid to my sometimes obviously novice attempts to handle their facilities.
July 29, 1938 .................. Born - Brooklyn, New York
1960 ............................. B.S., Florida State University,
Tallahassee, Florida
1960-1962 ......................... Research Assistant, Department of
Sociology and Anthropology,
University of Alabama, University,
Alabama
1962-1964 ......................... Research Assistant, Middle American
Research Institute Dzibilchaltun
Project, Merida, Yucatan, Mexico
1964 ............................. M.A., University of Alabama,
University, Alabama
1964-1967 ......................... Instructor, Department of Sociology
and Anthropology, Miami University,
Oxford, Ohio
1968-1969 ......................... Teaching Assistant, Department of
Anthropology, The Ohio State
University, Columbus, Ohio
1969-1971 ......................... Instructor, Department of Sociology
and Anthropology, Miami University,
Oxford, Ohio
1971 . . . . . . . . . . Assistant Professor, Department of Sociology and Anthropology, Western Illinois University, Macomb, Illinois

PUBLICATIONS


FIELDS OF STUDY

Major Field: Prehistory

Studies in Field Methods. Professor Thomas Rhys Williams.


Minor Field: Ethnology

Studies in Psychological Anthropology. Professor Erika Bourguignon.


Studies in Melanesian Ethnology. Professor Richard A. Krause
TABLE OF CONTENTS

ACKNOWLEDGEMENTS ................................................................. 11
VITA ......................................................................................... iv
LIST OF TABLES ................................................................. x
LIST OF ILLUSTRATIONS ......................................................... xii
INTRODUCTION ........................................................................ 1
Chapter

I. DEFINITION OF THE PROBLEM ................................................. 9

Outline of Maya Prehistory
Problems in the Social Interpretation of the Maya Sites
Urbanism and Social Stratification in Classic Maya Society
Settlement and Community Pattern Research in the Maya Lowlands
Relationship between Social Complexity and Housing

II. APPROACHES TO MAYA PREHISTORY ................................ 26

Scholarly Emphasis in the Context of Maya Studies
Two Outlooks in the Interpretation of Prehistoric Lowland Maya Society
Four Problems in the Social Interpretation of Maya Ruins

III. SIXTEENTH AND SEVENTEENTH CENTURY SPANISH WORKS .... 31

Las Casas and the Decline of New World Populations
The Relaciones De Yucatán
The Sixteenth Century Population Decline in Yucatán
Civil Congregation and Related Problems
Sixteenth Century Maya Housing and Settlement Patterns
Interpretations of Sixteenth and Early Seventeenth Century Spanish Documents

IV. MORGAN, BANDELIER, AND THOMPSON: PIONEER STUDENTS OF MAYA DOMESTIC ARCHITECTURE ............................. 53

Morgan's Point of View Concerning Indians
Morgan's Analysis of Maya Architecture
Thompson's Test of Morgan's Interpretations

V. STUDENTS OF THE MAYA GREAT TRADITION ..................... 63

Diffusionist Thought in Mesoamerican Studies
Decipherment of the Maya Calendar

VI. CULTURAL ECOLOGY AND THE CLASSIC MAYA COLLAPSE ........ 66

Early Studies of Swidden Farming
Environmental Potential of Tropical Rainforests
Economic and Social Consequences of Swidden Farming
The Wittfogel Hypothesis and Related Ideas
Palynological Evidence for Ecological Change in the Maya Lowlands
Summary

VII. SETTLEMENT AND COMMUNITY PATTERN RESEARCH IN THE MAYA LOWLANDS ........................................ 88

Sylvanus Morley's View of Maya Settlement Patterns
Thompson's Settlement Pattern Survey in British Honduras
The Ricketson Study at Uaxactun
Thompson's Linguistic Evidence
Contemporary Studies
Summary

VIII. STUDIES OF MAYA HOUSES .................................. 102

Wauchope's Description of House Mounds
Willey and Bullard's View of Maya Housing
Bullard's Contrast Between Prehistoric and Modern Maya Houses
Houses at Postclassic Mayapan
Summary

vii
<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Chronological divisions in the prehistory of the Maya lowlands according to Andrews (1965a)</td>
<td>224</td>
</tr>
<tr>
<td>2. Ceramic phases represented at 392 unvaulted structures test pitted by Cottier</td>
<td>225</td>
</tr>
<tr>
<td>3. Variety of unvaulted structures at Dzibilchaltun</td>
<td>226</td>
</tr>
<tr>
<td>4. Ceramic phases represented in sherd collections from 392 test pitted structures by structure type</td>
<td>227</td>
</tr>
<tr>
<td>5. Dated unvaulted construction determined through test excavations listed by structure type and phase</td>
<td>228</td>
</tr>
<tr>
<td>6. Kinds of investigations carried out at 240 vaulted buildings located in the mapped area of Dzibilchaltun east of the Merida-Progresso Highway</td>
<td>229</td>
</tr>
<tr>
<td>7. Location, size, and substructure height of 150 Early Period vaulted buildings on the map of Dzibilchaltun</td>
<td>230</td>
</tr>
<tr>
<td>8. Location, size, and substructure height of 14 Transitional vaulted buildings on the map of Dzibilchaltun</td>
<td>237</td>
</tr>
<tr>
<td>9. Location, size, and substructure height of 73 Pure Florescent vaulted buildings on the map of Dzibilchaltun</td>
<td>239</td>
</tr>
<tr>
<td>10. Location, size, and substructure type of 3 Black-on-Cream vaulted buildings on the map of Dzibilchaltun</td>
<td>243</td>
</tr>
<tr>
<td>11. Comparison of the sizes of Early Period Phase II and Pure Florescent vaulted buildings</td>
<td>244</td>
</tr>
</tbody>
</table>
12. The sizes of 261 platform or terrace complexes on the map of Dzibilchaltun ............................................. 245

13. Comparison of the distances of late Classic vaulted structures from the centroids of Early Period Transitional and Pure Florescent vaulted buildings ............................................. 246

14. Comparisons of the distance from the weighted centroid of all late Classic vaulted architecture, J3240687, to Early Period, Pure Florescent, and Transitional vaulted buildings ............................................. 247

15. Comparison of the percentage of Early Period and Pure Florescent Architecture located within various distances of their centroid ............................................. 248
## LIST OF ILLUSTRATIONS

<table>
<thead>
<tr>
<th>Figure</th>
<th>Illustration Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Map of the Maya region</td>
<td>249</td>
</tr>
<tr>
<td>2.</td>
<td>Aerial photograph of Dzibilchaltun</td>
<td>251</td>
</tr>
<tr>
<td>3.</td>
<td>Distribution of known Formative structures</td>
<td>253</td>
</tr>
<tr>
<td>4.</td>
<td>Distribution of known Early Period Phase I structures</td>
<td>255</td>
</tr>
<tr>
<td>5.</td>
<td>Distribution of known Early Period II and Pure Florescent Phase structures</td>
<td>257</td>
</tr>
<tr>
<td>6.</td>
<td>Distribution of known Modified Florescent Phase structures</td>
<td>259</td>
</tr>
<tr>
<td>7.</td>
<td>Distribution of known Black-on-Cream structures</td>
<td>261</td>
</tr>
<tr>
<td>8.</td>
<td>Distribution of known Decadent structures</td>
<td>263</td>
</tr>
<tr>
<td>9.</td>
<td>Structure 3721 (K737m645), an apsidal unvaulted building on a low platform</td>
<td>265</td>
</tr>
<tr>
<td>10.</td>
<td>Another view of structure 3721 (K737m645)</td>
<td>267</td>
</tr>
<tr>
<td>11.</td>
<td>Structure 3605 (I615q003), an apsidal unvaulted building on a low platform</td>
<td>269</td>
</tr>
<tr>
<td>12.</td>
<td>Structure 3610 (I695p890), an apsidal unvaulted building on a very low platform</td>
<td>271</td>
</tr>
<tr>
<td>13.</td>
<td>Stone-by-stone groundplan of structure 736 (J597p876), an apsidal unvaulted building</td>
<td>273</td>
</tr>
<tr>
<td>14.</td>
<td>Groundplan of structure 777 (J785p939), a single-roomed rectangular unvaulted structure</td>
<td>275</td>
</tr>
</tbody>
</table>
15. Groundplan of structure 730 (J693p829),
a single-roomed rectangular unvaulted
building situated on a low platform ....... 277

16. Groundplan of structure 722 (J542p745),
a multi-roomed rectangular unvaulted
building ................................................. 279

17. Comparison of the size of Early Period and
Florescent Vaulted Buildings ............... 281

18. Groundplan of structure 784 (J802q247),
an Early Period vaulted structure .......... 283

19. Distribution of Early Period vaulted
architecture on platform or terrace
complexes ............................................. 285

20. Distribution of Pure Florescent vaulted
architecture on platform and terrace
complexes ........................................... 287

21. Distribution of all "late Classic" vaulted
architecture on platform and terrace
complexes ........................................... 289

22. Groundplan of the platform-terrace complex
consisting of structures J865p590,
J877p572, J883p582, and J883p587 ....... 291

23. Groundplan of the platform-terrace complex
consisting of structures K3501816,
K3681827, K3751803, and K3851817 ....... 293

24. Distribution of architecture on the map of
Dzibilchaltun ....................................... 295

25. Reconstruction drawing of a cluster of
ruins at Dzibilchaltun made by
John C. Scheffler ............................... 297

26. Distribution of vaulted buildings on the map
of Dzibilchaltun ................................. 299

27. Contrasts in the cumulative percentage of
Pure Florescent and Early Period vaulted
architecture within 1400 meters of the
weighted centroid of all late Classic
architecture ........................................ 301
28. Contrasts in the cumulative percentage of Pure Florescent and Early Period vaulted architecture within 4000 meters of the weighted centroid of all late Classic vaulted architecture .......................... 303
INTRODUCTION

This dissertation is a case study of community form and social organization at prehistoric Dzibilchaltun, an archaeological site in Yucatan, Mexico (see Figure 1). Preliminary reports concerning settlement pattern research at that site have already evoked considerable debate and comment, especially since the map of architectural remains there was published (Stuart, Scheffler, Kurjack, and Cottier 1965; cf., Andrews 1965a, 1965b, 1968; Willey and Bullard 1965:370-372; Sanders and Price 1968:60). During the period between October of 1962 and September of 1963, I was responsible for surveying 8 of the 19 square kilometers covered by the map; subsequently from December of 1963 to August of 1964 I prepared detailed descriptions of domestic architecture in all parts of the site. The map of Dzibilchaltun indicates that site was a far larger community than previous settlement pattern studies would lead one to expect. Indeed, several scholars have cited the map and the preliminary reports describing the community as evidence against the currently popular view of prehistoric lowland Maya society being a "civilization without cities" (Willey 1969:97; Sanders and Marino 1970:59-61; cf., Wolf 1959:101; Pollock 1965:378; and Haviland 1966a:31). The references cited show that conflicting interpretations of the map of Dzibilchaltun constitute a significant problem in Mayan studies. My dissertation is a formal presentation of settlement and
community pattern data from Dzibilchaltun; it should help to clarify
the points on which scholars disagree.

In this dissertation I prepare an analysis of the map of
Dzibilchaltun. The fieldwork that resulted in the map, both my own
and that of others, is described. Examples of the 8,398 buildings
depicted on the map are examined in detail. A study of the spatial
distribution of pottery types found in a large series of test
excavations is used to illustrate how various parts of the site were
utilized during different time periods; this treatment shows that most
of the structures on the map are "late Classic" in their provenience.
Comparison of the amount of evidence from each period in the site's
history provides an estimation of the changes that took place in the
size of Dzibilchaltun's population through time.

The analysis of the map proceeds by classifying the buildings
plotted on it into types based on the amount of energy used to construct
them. Next the patterns formed by the distribution of the types
through space are examined. Particular attention is given to the
distribution of vaulted ruins, the most "expensive" type in terms of
energy cost. Temporal changes in the spatial distribution of the
vaulted buildings are examined. This analysis results in a
description of the form of a "late Classic" lowland Maya community.
Similar studies have been carried out in other parts of the Maya low-
lands; but these studies yielded conflicting results (cf., Ricketson
1937; Bullard 1960; Smith 1962; Willey, et al. 1965; Haviland 1966a,
1969).
At a higher level of abstraction, this dissertation is an attempt to use the analysis of community form at Dzibilchaltun as a basis for inferences concerning the structure of prehistoric lowland Maya society and the processes involved in its history. By studying architectural remains, I try to evaluate the evolutionary status of the prehistoric lowland Maya. My review of the literature shows that considerably different positions have been taken on this subject by various authors. Therefore, through examination of new data from Dzibilchaltun, I attempt to show how much social differentiation was characteristic of prehistoric lowland Maya society. In particular I examine the usefulness of the concepts "urban community," "complex society," and "social class," in the prehistoric lowland Maya context. The definition of these terms and how the phenomena they describe would be reflected in architecture is found in Chapter I. My conclusions support the scholars who use these terms in their studies of prehistoric Maya society.

Anthropologists have, in recent years, searched for the ecological factors contributing to the growth of social differentiation in human groups and the consequent development of complex societies. Most students, however, have not found any factor that would create a pressure for the development of complex societies in the Maya lowlands. Though the prehistoric lowland Maya produced monumental art, writing, and other attributes considered characteristic of civilizations, the tropical lowland setting of these people has traditionally been considered poorly suited for a society with marked social differentiation or complexity (Huntington 1915; Meggers 1954; Sanders and Price 1968; cf. Rathje 1971). Finding themselves unable to explain the ecological
conditions that led to increased social differentiation, some scholars have argued that there was relatively little social differentiation among these people. Studies of prehistoric lowland Maya housing and settlement patterns have played an important role in the development of this position. In this dissertation, new data from Dzibilchaltun are examined with respect to the criteria used to formulate that position. The conclusion of this study is that social differentiation in prehistoric Maya society had evolved to an advanced state.

During the early years of the present century scholars such as Thompson (1886, 1892) and Morley (1915, 1917, 1920, 1946) considered prehistoric lowland Maya society to be culturally complex, quite stratified, and relatively large in terms of population. This position is maintained by recent writers including Redfield (1941, 1956), Barrera Vásquez (1951; Barrera Vásquez and Rendón 1948), Borhegyi (1956), Ruz (1964a), and Haviland (1966a, 1969). Some of these men believe that internal strife analogous to "class conflict" was an important factor in the history of the area (cf., Willey and Shimkin 1971:8). By the middle of this century Maya prehistory was often conceptualized in terms developed largely by the precursors of the modern "conflict theorists" (cf., Lenski 1966:1-23; Schermerhorn 1970:20-59).

In the years following the Second World War, the "functionalist" or "system theory" school of social stratification became important in the United States (Lenski 1966:14-17; Schermerhorn 1970:20-59). By contrast with conflict theorists the political conservative scholars of this school of stratification theory emphasized the functions rather
than the deleterious effects of social differentiation. The writings of evolutionists seeking to describe the ecological conditions under which trends toward increased social differentiation would have been highly adaptive generally complement the functionalist thinking (cf., Rathje 1971). If a phenomenon can be profitably studied through reference to the history of its development, such an examination of differentiation and stratification indicated their utility as social mechanisms. Certainly the early growth of social stratification seems to have been accompanied by desirable changes in the amount of energy available to man and society for exploitation of the environment.

Within this intellectual framework, the traditional view of prehistoric lowland Maya society as highly class structured was reappraised by several influential scholars, especially Willey (1956b, 1968), Bullard (1960, 1964; Willey and Bullard 1965) and Vogt (1964a, 1969). These men argue that estimates of the carrying capacity of the Maya lowlands suggest that the population density of the area must have been low. Low population density is, of course, correlated with minimal social differentiation. These scholars, in estimating the population of the Maya lowlands, touch on a problem that has been a debate since the sixteenth century (Dobyns 1966). Moreover, these scholars find that settlement pattern surveys and studies of prehistoric houses seem to confirm that Maya society was relatively egalitarian. Here they repeat an argument first advanced by Morgan (1869, 1880, 1881). In the absence of intense stratification, there could not have been much class conflict. Using this logic, Willey, Bullard, and Vogt seek to modify the traditional view of Maya society
and present the picture of a "democratic" Maya social system characterised by a small population, relatively little social differentiation, and small communities. I believe this present study of architecture at Dzibilchaltun indicates their position has been overstated.

In this dissertation I argue the following points:

1. Most of the architecture on the map of Dzibilchaltun, including most of the vaulted architecture, was utilized as housing.

2. The number of buildings on the map indicates the community had a large resident population.

3. The size of that community and the nature of the swidden system practiced by the people in that area today indicate the community form of Dzibilchaltun would not have been optimum for a population of swidden farmers. Therefore, considerations other than swidden farming were probably instrumental in determination of the community form observed on the map.

4. There are important contrasts in the form and energy cost of the building types that were used as houses at the site.

5. These contrasts can most economically be interpreted as evidence of internal social diversity. This diversity probably included both cultural heterogeneity and class structure.

6. The distribution of vaulted architecture at Dzibilchaltun, when contrasted with the distribution of the remains of thatched buildings, indicates both barrio or neighborhood divisions and a pattern of concentric zoning at the site.

7. Through time the spatial distribution of newly erected vaulted
buildings became highly concentrated. During the last part of the “late Classic,” construction effort was concentrated at the very center of the site. This spatial concentration of buildings whose construction required the greatest expenditure of energy suggests progressive concentration of power, wealth, and authority within the community.

8. The core of Dzibilchaltun is a cluster of vaulted ruin groups spread over an area of approximately three square kilometers. At the center of the core is an area of 0.25 square kilometers where vaulted ruins are particularly concentrated. In spite of the otherwise fragmented appearance of the map, the division of the map into three concentric zones based on the distribution of vaulted ruins, demonstrates that at least three square kilometers of the map can be considered a single community.

9. The size of the area defined by the clustering of vaulted ruins is too large to be considered a single "ceremonial center" used as a place where a largely scattered population congregated for ritual activities. It is too compact, however, to be viewed as a series of separate minor centers.

10. The concentric zoning indicates a hierarchical organization within the site.

11. Dzibilchaltun is more accurately portrayed as a "preindustrial city" (cf., Sjoberg 1960) with a socially heterogeneous population rather than an empty ceremonial center where members of an egalitarian society congregate when they are not engaged in swidden farming.
The analysis of the map of Dzibilchaltun leads me to the general conclusion that the prehistoric Maya who inhabited the tropical lowlands of Mesoamerica evolved a social and cultural system far more complex than many contemporary scholars would believe. This conclusion and the evidence on which it is based should be of interest to writers concerned with classic problems in anthropological theory such as explanation of the processes involved in the development of the state, the formation of class systems, and the rise of urbanism. It is generally agreed that the people who occupied the Maya lowlands in prehistoric times evolved a civilization. The history of their civilization, as interpreted by anthropologists, has been an important reference in the large body of literature concerning social evolution and cultural ecology (e.g., Morgan 1877; Huntington 1915; Steward 1949; Meggers 1954; Adams 1966; Sanders and Price 1968; Carniero 1970). In view of the conflicting opinions noted in the previous paragraphs, the additional research on the nature of prehistoric lowland Maya society presented in this dissertation is directly relevant to many problems that have long been important to anthropological theorists.
CHAPTER I

DEFINITION OF THE PROBLEM

The geographical setting of this study is the Maya area or that part of southern Mesoamerica where Mayan languages are spoken. Reference is often made in the pages that follow to three regions of ecological contrast within this setting. First, the mountains south of the Yucatecan peninsula constitute the "Maya highlands"; the highlands contrast with the low flat plains adjacent to them. These "Maya lowlands," in turn, may be divided into the "southern lowlands"; the area covered by tropical rainforest in the Peten District of Guatemala, in Belize, and in the adjacent parts of Campeche, Quintana Roo, Tabasco, and Chiapas, Mexico. The "northern lowlands" are drier areas covered with low scrub forest or bush, found mostly in the Mexican states of Yucatan and Campeche (cf., West 1964:375). The Peten District of Guatemala, an important area within the southern lowlands is also mentioned at various places in the text. These geographical locations and the important archaeological sites within them are shown in Figure 1, a map of the Maya area.

Outline of Maya Prehistory

The prehistory of the Maya area is treated extensively in the works of Morley (1946; Morley and Brainerd 1956), Brainerd (1954), Thompson (1954), and Coe (1966). An especially important synthesis of
the findings and problems in Maya prehistory is presented by Willey (1964). The historical scheme that best suits the data in this dissertation, however, is found in the works of Andrews (1960, 1965a), for much of the fieldwork that resulted in that scheme took place in the northern lowlands. The chronological sequence Andrews uses is presented in graphic form in Table 1; the phases and other chronological units in this sequence are used throughout the dissertation. The following paragraphs outline the principal developments in the prehistory of the Maya area as a whole.

Prehistorians have learned that by about 1500 B.C., sedentary farmers had replaced societies based on hunting and gathering economies in the Maya area (Coe 1966:42-51). The term "Formative" is applied to the stage of cultural development represented by these farming societies (Willey and Phillips 1958:144-181). Shortly after A.D. 1, the archaeological record in the area begins to include an art complex that is called "monumental" by the people who have studied it. In general, this art is considered analogous to the art of the classic civilizations of the Old World. The level of society marked by such monumental art in the New World is called the "Classic Stage" (Willey and Phillips 1958:182-192).

The amount of material culture associated with this Classic art complex becomes especially abundant during the period beginning either about A.D. 300 or A.D. 600, depending on whose chronology one wishes to accept (Willey 1964:153-156). The increase in material remains suggests that this "late Classic" era must have been one of increased population (Willey 1964:153-156). Soon, however, either around A.D. 600 or
A.D. 900, material culture evidencing human activity becomes very scanty, at least in the southern lowlands. This fact has been interpreted as evidence of a cultural decline; it is widely believed that the southern lowlands were largely depopulated as a consequence of this decline (Willey 1964:153-156; Willey and Shimkin 1971).

Societies in other parts of Mesoamerica seem to have been undergoing concurrent changes during and after the period of the decline in the southern lowlands. These changes included trends towards urbanism, increased secularization of culture, and greater stratification. The stage characterized by these changes is termed "Postclassic" (Willey and Phillips 1958:193-199).

It is difficult to use the Classic and Postclassic divisions in the northern lowlands. Andrews (1965a) calls the material termed "Classic" in the southern lowlands "Early Period." He believes the regional tradition in the northern lowlands continued after the cultural decline in the south. The "late Classic" material in the northern lowlands dating from after the decline in the southern lowlands is called Pure Florescent in his chronological formulations. The Early Period and Pure Florescent are marked by contrasting architectural styles, as described by Andrews (1965a) and in the data section of this dissertation. Pottery known to have been made in the southern lowlands is found associated with Early Period buildings in the northern lowlands, but is absent from buildings constructed during the Pure Florescent. The Pure Florescent phase seems to have lasted until A.D. 800-900, at which time many sites in Yucatan also seem to undergo a marked decline in population.
Two important Postclassic sites are found in the northern lowlands. The first of these is Chichen Itza, where strong influences from central Mexico are found blended with the characteristic Florescent material culture. Andrews calls the phase marked by this combination the "Modified Florescent." Later, at the site of Mayapan, poorly constructed buildings were erected. This kind of construction and, later during the same period, the lack of any monumental architecture at all marks Andrews' Decadent Period. The Decadent Period lasted until the Spanish conquest.

Use of pottery as index fossils for the phases in the chronological sequence of north Yucatan presents the prehistorian with some yet unresolved problems that have a bearing on this dissertation. At least three and perhaps more Formative phases are found in the archaeological record at Dzibilchaltun (Josink-Mandiville 1970). Most of the Formative pottery and architecture at the site seems to pertain to the middle Formative (Andrews 1965a) and may be considered part of the Chicanel horizon. Very little early or late Formative material has been found. Most of the Formative wares are not distinctive enough to be distinguished in the samples of small sherds usually taken from test excavations. For this reason, all the pottery from the Formative phases and all of the architecture marked by such pottery are grouped together in this dissertation.

Another problem is found in the study of late Classic wares at the site. From the later part of the first Early Period phase to the end of the Modified Florescent, Yucatecan ceramics are dominated by a waxy lustered pottery termed slateware. Enough is known about the
changes in the characteristics of this pottery and associated types that Andrews and other students of Maya ceramics believe that the Early Period Phase I pottery, called Pilim, can be distinguished from the wares of the Early Period II and Pure Florescent Phases which are called Copo. Copo pottery could also be distinguished from Zipche or Modified Florescent pottery. But the wares made during about 600 years of the site's history, through both the Early Period II and Pure Florescent phases, cannot be separated. Though the formal architecture is quite distinctive, both types of vaulted architecture are marked by the presence of Copo pottery.

This dissertation describes the material culture and makes inferences concerning the social organization of Dzibilchaltun, a prehistoric community in the northern lowlands. Most of the material remains at Dzibilchaltun are "late Classic" in their provenience. The term "late Classic" refers to the second phase of Andrews' Early Period and his Pure Florescent phase, the phases marked by the presence of Copo pottery. The inferences derived from this study are compared with the results of similar studies concerned with late Classic sites in the southern lowlands, considered by Andrews to be coeval with his second Early Period phase. Research concerning the cultural development of the people situated in the Maya area during those times has constituted an important problem in both Mesoamerican studies and anthropology as a whole.

**Problems in the Social Interpretation of Maya Sites**

The substance of this dissertation is an examination of prehistoric lowland Maya architecture in order to determine the degree of social differentiation or social complexity characteristic of that
society. In particular, the applicability of the concepts "urban community," "complex society," and "social class," to these people is evaluated. These terms are defined below. Following the definitions is a discussion of the manners in which the types of human behavior implied by these concepts are reflected in architecture.

The concepts listed in the paragraphs above are related to thinking concerning a very basic problem in the social sciences—description, definition, and explanation of the mechanisms that create and maintain human societies. Two general types of binding force which results in the creation and maintenance of societies has been recognized by scholars: (1) Human beings coexist harmoniously because they are alike in contrast to other humans. In this case it is the similarities among individuals that form the basis of the social bond. (2) Humans live together because of interdependence due to differences in their capacities, abilities, and activities. Here it is diversity that brings about social unity. Durkheim (1949) calls the first force "mechanical solidarity" and the second force "organic solidarity."

Both of these forces are thought to be instrumental in the maintenance of all societies.

Comparative studies have shown that the importance of organic solidarity as a mechanism of social cohesion varies greatly from society to society. All humans are unique, thus all societies contain humans with different abilities and capacities. Some of these abilities and capacities are always more highly valued than others, and for this reason the individuals in all societies are ranked in a stratification system. The basis for organic solidarity is these differences between
members of a society. In some societies the social differentiation
that can create organic solidarity is relatively small while in others
it is relatively large. Societies in the first category are considered
"simple" while those in the second group are called "complex."

This dissertation concerns one of the oldest problems in
anthropology. For over a century scholars have argued over the
complexity or evolutionary status of prehistoric Maya society. Urbanism,
subcultural heterogeneity, sizeable population, highly organized
political structure, large amounts of energy utilized by advanced
technology, quality art, and monumental architecture are all included
as part of the term "social complexity" (cf., Mayer-Oakes 1968:35-36).
The prehistoric Maya created the kind of monumental art and architecture
characteristic of a civilization, yet a number of scholars believe
ancient Maya society was relatively egalitarian and not highly
stratified as were the classic civilizations of the Old World. These
scholars also maintain that the larger Maya communities were not large
enough to be considered truly urban. Other writers argue to the
contrary. Interpretation of the complexity of prehistoric lowland Maya
society is a problem that figures prominently in the works of Louis
Henry Morgan (1880:70-76) and his contemporaries. The debate is
continued today by specialists in Mesoamerican prehistory and
ethnology such as Willey (1956b, 1968:220-222), Ruz (1964a), and Vogt
(1969:588-605). In both the past and the present this debate has had
an influence on research and theory in cultural ecology, social
evolution, and other broad areas of anthropological thought.
Urbanism and Social Stratification in Classic Maya Society

This dissertation is an attempt to resolve some of the problems raised by conflicting interpretations of patterns of prehistoric Maya social and community organization. Attention will be focused on phenomena related to two areas of social complexity: (1) the degree of urbanism and (2) the extent of social stratification in Classic Stage Maya society. These subjects are intimately related to many other aspects of prehistoric Maya technology, economy, and social organization. In the course of the discussion to follow some of these corollary topics will also be examined for their relevancy to the two manifestations of social complexity to be studied.

The term "urban" also implies a social system in which there is considerable social differentiation. In his classic description of folk and urban communities in Yucatan, Redfield (1941) emphasizes the diversity in occupation, wealth, and life style characteristic of urban communities. The other aspects of urban life pointed out by Redfield, a secular ethos and an impersonal mode of interaction, seem to be functions of both this heterogeneity and the total number of individuals in the community. Urban communities, in contrast to folk communities, contain more individuals than any one member of the community can know personally; for this reason patterns for interacting with strangers on a daily basis are necessary. This kind of impersonal interaction begins to appear in communities with populations over 2,000. In communities containing over 25,000 people the characteristics of urban life are usually pronounced (Schaedel 1966).
Urbanism, then, involves two kinds of phenomena; one demographic and the other cultural (cf., Mayer-Oakes 1960:167-168). The question to be answered in demographic terms concerning Maya urbanism is: Did the populations of the larger prehistoric Maya communities of the Classic Stage reach proportions which can be considered urban? Operationally, the population size of a prehistoric community can be estimated from the number of buildings utilized by the people of that community at any given time. Thus the first part of the problem of urbanism becomes a question of how many buildings made up the larger prehistoric Maya communities during the Classic Stage.

But the problem of urbanism also involves a cultural dimension. Societies characterized by the presence of cities and towns usually exploit their environment by means of groups of specialists adept at the production of certain commodities. The distinct technologies involved in this kind of specialized production are the cores of cultural heritages that are transmitted from generation to generation. One group of specialists possessing such a heritage would consist of the rural food-producers that sustain the city-swellers. Groups of craft specialists living within the city also share certain cultural behavior patterns that form the core of subcultures. Too, the integration of the work of the various groups of specialists contributes to formation of an urban elite that direct the workings of the entire society. Societies with this type of social structure have been considered "advanced" in their evolutionary status because their exploitative systems are far more productive than even those of structures such as chiefdoms with complex redistributive systems.
Chiefdoms have far less internal differentiation and economic specialization. Thus in addition to the actual size of the Classic Stage Maya community, the question may also be raised: What archaeological evidence for the presence of economic differentiation can be found in the remains of Classic Maya communities.

The term "class" also denotes a form of social differentiation. While the term has been used in many ways, recent writers like Lenski (1966) and Harris (1971) use the concept in reference to differences in the distribution of power in a society. Harris' definition of class seems particularly easy to operationalize in terms of the data to be examined in this dissertation; it is quoted below:

A class is a group of people who possess similar amounts of power per capita (always allowing for sex and age) and who exert similar forms of control (or lack of control) over basic resources, the tools and techniques of production, and the flow of socially available energy (Harris 1971:515).

Harris emphasizes asymmetrical control of the energy resources of a society in his definition. The presence or absence of behavioral phenomena that could be examined by means of the class concept then, should be reflected in the material culture available for the scrutiny of the prehistorian.

The area of a community is usually divided into small and large units directly under the control of certain individuals. When such units are compared with respect to the amounts of energy used to modify them, the comparison should result in similarities if the society is relatively egalitarian and in contrasts if the society is class structured. We may expect that the greater the amount of energy available to an individual, the larger the amount of energy expended in
the territory he controls. One important means of modifying such territories, of course, is architectural construction.

A second advantage for the prehistorian attempting to study class is inherent in Harris' discussion of the subject. Harris insists that emic and etic treatments of any social phenomena be distinguished. An etic definition of class is best suited for cross-cultural comparisons. For this reason he rejects "class consciousness" as a criterion of class. Prehistorians are, of course, largely confined to etic data; therefore, emic definitions would not be amenable to their treatments.

This dissertation, then, will deal principally with three facets of the problems involving the social and cultural complexity of Classic lowland Maya society. First, an attempt will be made to determine the size of one Classic Maya community. Secondly, the evidence for internal cultural differences within that prehistoric Maya community will be examined. Third, the data from the remains of this ancient Maya community will be searched for evidence for the extent of social stratification. Specifically the evidence will be evaluated in order to learn if the concept of "class" may be usefully applied in the study of these prehistoric people.

Settlement and Community Pattern Research in the Maya Lowlands

Settlement and community pattern analysis has played an important role in the development of arguments about the complexity of prehistoric lowland Maya society. Anticipating some of the latest trends in archaeological research, Morgan (1880, 1881) marshalled all
of the available data on prehistoric Maya domestic architecture and community planning as part of his evidence for a unilinear theory of social evolution; he even formulated research plans for gathering more data on this subject from the Maya lowlands. Recently much of the discussion on the problem of lowland Maya complexity has centered around settlement pattern data collected in the southern Maya lowlands by adherents of opposing viewpoints. Willey and Bullard (1965) have interpreted their data from that region, partly by analogy to the modern Maya of the Chiapas highlands studied by Vogt (1964a), as evidence for less complex prehistoric Maya social organization. But Haviland (1969) and his associates consider data from the large Classic site at Tikal in the Peten lowlands as evidence for a relatively complex society. Such a theoretical conflict indicates a need for additional data.

This dissertation examines the theoretical implications of settlement and community pattern data from the archaeological site at Dzibilchaltun, Yucatan, Mexico. The data to be used here consist of information about ruined buildings and their distribution. The behavior reflected by these data would seem to be a central part of human adaptive activity closely related to other aspects of economy and social organization. A study of these data in the setting of Maya prehistory can therefore be expected to add an insight to knowledge of Maya life and society. And, the perspective gained from such a study would have direct bearing on the theoretical problems noted above, for both urbanism and social stratification can be assumed to be reflected in human architecture and community patterns.
The question of urbanism has been the principal theme of community pattern research at the site of Dzibilchaltun. Many Mesoamericanists (Morgan 1880:73-73; Ricketson 1937; Willey and Bullard 1965; Coe 1966:91-94; Sanders and Price 1968:144) consider the large sites in the Maya lowlands to have been merely aggregates of ceremonial architecture. The populations who built and supported these sites are thought to have lived in small, evenly dispersed hamlets in the surrounding sustaining area. The living centers themselves, it is believed, did not have resident populations large or dense enough to meet the demographic requirements of true cities.

The problem of prehistoric Maya urbanism also involves questions about social organization. Mayanists such as Redfield (1941:368, 1956:74-76), Barrera Vásquez (1951:221-222), and Borhegyi (1956) believed that Maya society in the lowlands had evolved folk and urban components during the Classic Stage. But advocates of the more popular view of dispersed settlement patterns, from Morgan (1880:73-74) to Willey (1956b), Bullard (1964), and Vogt (1969:588-605), have all argued that Maya society was far less complex in its social organization. Rather than an aloof urban elite ruling an increasingly alienated rural peasantry, these scholars have concluded that the people who made up the ancient Maya populations played important roles in all of the social, political, and economic activities which took place both in the centers and the surrounding farmlands. These scholars believe that the farmers and the people of the largely nonresidential centers were one and the same.
The extent and complexity of the ancient Maya stratification system are related problems. Many students of Maya prehistory readily accepted statements from early Spanish authors concerning the presence at contact of an indigenous nobility. Moreover, the elaborate buildings constructed by the Maya were interpreted as the remains of a complex civilization; analogous civilizations such as Egypt and Mesopotamia were thought to have been characterized by highly stratified societies. Thus, the idea of an ancient Maya society rigidly divided into "noble," "commoner," and "slave" classes was developed. The writings of the Spanish conquerors both inspired and reinforced the interpretations of the prehistorians.

Objections to these interpretations of a rigid Maya class system have evolved principally from the recent settlement pattern research in the southern Maya lowlands. Willey (1956b) and Bullard (1960, 1964) have reported that the Classic Stage Maya in that region lived in hamlets evenly dispersed in the sustaining area of the major ceremonial center; that the density of these populations was relatively low; that the Maya erected minor ceremonial centers near their homes and in most cases were never very far from a major ceremonial center; and that the dwellings of all the Maya farmers were relatively large and well-constructed. Willey and Bullard do not believe that these data were compatible with an interpretation of Maya social organization that includes a system of rigid classes.

Ethnological studies of modern Maya populations in the highlands of Chiapas seem to lend support for the views of Willey and Bullard. Vogt (1969:588-605) argues that the settlement pattern of the modern
inhabitants of Zinacantan resembles the archaeological situation described by Willey and Bullard for the southern Maya lowlands. Vogt presents a case for a very close analogy in other areas of culture such as religion and social organization. The Maya of Zinacantan possess an elaborate system of rotating religious offices fundamental to their social integration. Vogt (1964) suggests that the positions of ritual and secular leadership in ancient Maya society were both filled by rotation among the farmers on a temporary basis. Class organization in such a system would be rudimentary. Vogt considers lineage structure to have been far more important than class structure in ancient Maya society.

The interpretation of Maya society presented by Willey, Bullard, and Vogt has been attacked by Ruz (1964) and Haviland (1966). Ruz cites ethnohistorical evidence that is not compatible with the interpretation. Haviland's arguments are based on settlement pattern data from Tikal; these data do not support the conclusions of the surveys of Willey and Bullard. Other students (Proskouriakoff 1960; Kelley 1962) have found evidence for hereditary dynastic rulers in the glyphic inscriptions on Classic monuments. It is clear that prehistorians do not agree about the most basic aspects of Classic Maya social organization.

**Relationship Between Social Complexity and Housing**

In light of the disagreements noted above and the importance of the case of the prehistoric lowland Maya for social research, further evidence dealing with the topics of stratification and urbanism in Maya prehistory would be a useful addition to the literature. Prehistorians
agree that one form of evidence available to them is the remains of architecture; most of them would agree that the phenomena referred to by the concepts "urban" and "class" are expressed in housing. Indeed, Sjoberg (1960:48) suggests that lack of information about this subject has resulted in sociologically naive assumptions by archaeologists studying the Maya.

The heterogeneity of cities, the social differentiation in complex societies, and the asymmetrical distribution of power in class systems are all manifest in the houses created by the people of such socio-cultural systems. Each of these concepts implies the presence of distinct life styles that include contrasting patterns of consumption. One kind of consumption involves acquisition and use of different kinds of housing. The most specific of these concepts, that of class, has traditionally been associated with differences in housing. Almost every scholar making a community study in a complex society has indicated that the houses of the upper classes varied in cost and location from the houses of the lower classes (Lynd and Lynd 1929; Powdermaker 1939; Hollingshead 1949; Warner, Meeker, and Eels 1949). It is therefore entirely consistent with both theory and method in the social sciences to expect social differentiation to be reflected in architecture.

This dissertation examines the arguments about social organization in prehistoric lowland Maya society referred to in the previous pages in light of new data about prehistoric Maya housing from Dzibilchaltun. The study will be divided into three parts: first, archaeological and ethnohistorical works on Mayan housing, population,
social organization, and settlement pattern will be reviewed and the
major points on which scholars disagree summarized. The second section
contains the data from Dzibilchaltun. The last part of the dissertation
will contain the conclusions derived from analysis of this new evidence.
The study of prehistory in the lowland Maya region of Central America became popular during the developmental period of anthropology in the nineteenth century. The scholars of that era seem to have been fascinated by the books of John Lloyd Stephens (1841, 1843) which describe and illustrate Maya ruins. These works made the prehistory of the Maya lowlands a particularly controversial subject. Soon after Stephens' books appeared in print, early anthropologists began using his data as primary evidence for their conflicting theories about the entire sweep of culture history. At that time adherents of the opposing evolutionist and diffusionist schools of prehistory disagreed in their interpretations of almost every aspect of Maya society. Many of the arguments among the nineteenth century scholars of the Maya were never resolved; indeed, some of the most important contemporary problems in the study of Mayan archaeology had their origins at that time. Controversies among students of the Maya have often been important in the history of anthropological ideas; thus a detailed review of the literature on interpretation of Maya social organization is almost an abridged "history of ethnological theory."

**Scholarly Emphasis in the Context of Maya Studies**

The scholars who have examined Mayan ruins were usually specialists in particular aspects of archaeology. The Maya lowlands are
rich in direct evidence that can be fruitfully studied; due to the quantity and variety of data, prehistorians have found it profitable to concentrate their efforts in the study of art, architecture, pottery, hieroglyphic writing, or some other category of archaeological remains. The kind of evidence examined by a student of the problems in lowland Maya prehistory has tended to affect his conclusions.

Scholars are aided in their interpretations of the direct archaeological evidence by a large amount of ethnohistorical and ethnographic data. Sophisticated use of these data also requires a high degree of scholarly specialization because inferences concerning the ancient lowland Maya have been profitably drawn by analogy from sixteenth century accounts of the Yucatec and other Maya groups, ethnographic works on the modern Yucatec, recent publications relating to the Tzeltal and Tzotzil speakers of the Chiapas highlands, studies of the Lacandon Maya of the Usumacinta River basin, and even the Khmer Empires of prehistoric Cambodia and other Southeast Asian groups. These societies exhibit a wide variety of social and cultural characteristics, not only the archaeological evidence for the nature of prehistoric lowland Maya society but also the sources for interpreting this evidence was quite varied.

Inevitably, some scholars have stressed the importance of certain categories of evidence over other categories. Some ethnographic sources for the interpretation of the direct data have been more popular with some students than others. For example, Proskouriakoff (1960, 1963, 1964), after comparing and contrasting elements from hieroglyphic texts in time and space, reached the
conclusion that this direct evidence indicates the presence among the prehistoric Maya of hereditary royalty. Sanders (1963:230-233) cites sixteenth century accounts of Yucatan which would, by analogy, support this interpretation. But Willey (1956b:777; 1968:221) and Bullard (1964:285-286) speak of a more democratic form of social organization in the Maya lowlands during the Classic stage, basing their conclusions on archaeological settlement pattern data, another form of direct evidence, and drawing their analogies from Vogt's (1964) studies of the present inhabitants of the Chiapas highlands. The permutations and combinations of the arguments that have consistently been of interest to Mayanists, and which use the various forms of evidence and sources for interpretation, are almost endless. The construction and evaluation of the many arguments have become an academic art.

**Two Outlooks in the Interpretation of Prehistoric Lowland Maya Society**

Mayanists and other students of aboriginal Mesoamerican society have generally favored one of two outlooks. Men like Stephens, Le Plongeon, and Morley were greatly impressed by Maya art, architecture, and science; as a result, they tended to view Maya culture as a remarkable, perhaps even unique, human achievement. They thought the Maya had evolved the sophisticated technologies and forms of social organization characteristic of "high civilizations." The men of the second group, including Morgan and Bandelier, tried to study the Mesoamericans in the context of the whole of North American ethnology and prehistory. Their conclusion seems to be that Maya society was a tribal system similar in many respects to other New World agricultural peoples. Recent data
concerning problems in the study of Maya society have been given con­
flicting interpretations by scholars adhering to these two points of
view.

Four Problems in the Social Interpretation
of Maya Ruins

Four interrelated topics seem particularly important in the
history of Mayan studies. Each one is directly related to the problems
examined in this dissertation. Many of the principal disagreements
concerning the topics can be traced from the sixteenth century to the
present. The first topic is an interest in the size of Maya populations
through time. Some scholars believe that the Maya populations were
very large while others consider them to have been very small (Lange
1971). The second topic is the question of urbanism in Maya society.
Some scholars describe the larger Maya communities as cities or towns
while others deny that these communities ever had the population size
or density to have been truly urban centers (cf., Willey and Bullard
1965; Andrews 1968). Questions about Maya housing usually appear in
the context of this topic. The third controversial topic consists of
various interpretations of preconquest Maya social organization. Anthro­
pologists differ on questions concerning the strength of social
stratification and the importance of unilineal kin groups in Maya social
very old problem in this connection involves the accuracy of early
Spanish descriptions of Maya society; some scholars believe that the
Spanish writers read too much of their own social forms into what they
saw of indigenous customs (Morgan 1876). The fourth topic is a search
for an explanation for the collapse of Classic Maya society as evidenced by the cessation of architectural construction and dated monument building at various sites, especially in the Peten District of Guatemala (Cowgill 1964; Sabloff and Willey 1967; Willey and Shimkin 1971). Even before reliable evidence of the collapse was compiled, people wondered why the large architectural complexes in the Maya lowlands had been abandoned. Revolution, conflict between segments of Maya society, ecological and natural disaster, and a number of other factors are suggested as explanations for this abandonment or collapse of the Classic Maya. In discussions concerning any of these four topics, most scholars have examined at least some aspects of one of the other topics in addition; thus the four topics have a common history that will be reviewed in the following pages.

The following sketch of the history of the ideas listed above is divided into six parts. First the works of sixteenth and early seventeenth century Spanish writers are examined. Then the ideas of Morgan and Bandelier, seldom discussed in the context of Maya studies, are treated in detail. The next section deals with the students of the "Maya great tradition," whose views of Maya society are in opposition to those of Morgan. Finally, the works of contemporary students of cultural ecology, settlement pattern, and domestic architecture in the Maya lowlands are reviewed.
CHAPTER III

SIXTEENTH AND SEVENTEENTH CENTURY SPANISH WORKS

The Spanish conquerors of Mesoamerica were the first academicians to study aboriginal American society. The aims of the Spaniards in the New World were conquest, economic gain, religious conversion of the Indians, and colonial administration. They may have been the first Europeans to use applied social science in the achievement of such aims, for Spanish priests and conquerors often studied native languages and customs in pursuit of these ends. Questionnaires and reports, many of them available today, were also compiled in efforts to keep policy makers informed.

Several questions arising from the conquest of the New World Indians were bitterly contested during the sixteenth century. Hanke (1935:3-18) lists some of these: What was the origin of the American Indians? Were the natives rational beings, savages, barbarians, or some sort of half-human beasts? Were they pagans who had never known Christianity or perhaps relapsed infidels? Could their self-evident social and religious errors be corrected with proper education? Had God created the Indians free or were they by nature slaves? And, most important, did these Indians have the innate capacity to accept Christianity and Spanish civilization? The written arguments touching on these and similar debates were filled with a wealth of data pertinent to the four topics under discussion.
Arguments concerning the nature of the New World natives were
vehement during the first century of Spanish rule in Mesoamerica.
There were two conflicting schools of thought (Hanke 1935:20-23): some
individuals, usually from the ranks of the clerical orders, thought of
the Indians as "noble savages." Their rivals, mostly the Spanish
colonists with royal grants called *encomiendas* giving them the right to
collect tribute and services from the Indians, thought of their charges
as "dirty dogs."

**Las Casas and the Decline of New World Populations**

Bartolome de Las Casas, the "Apostle of the Indians," was a lead­
ing member of the "noble savage" school. This man, the first bishop of
Chiapas, was a constant champion of peaceful methods for conversion of
the Indians and a designer of utopian Christian communities for them
(Hanke 1949:54-71). Las Casas became popular because of a treatise
printed in 1542, called *Brevísima Relación De La Destrucción De Las
Indias*, a vivid protest against Spanish excesses during and after the
conquest. This popular work was translated into Latin by 1558, French
by 1579, German by 1599, Dutch by 1610 and Italian by 1626 (Bandelier
1880:85). Translated into English (Las Casas 1656) and embellished with
gruesome illustrations, the *relación* became a weapon of anti-Spanish
propagandists.

Las Casas (1953:25; cf., Rosenblat 1954:100-101; Dobyns 1966:
396) charged that some twelve to fifteen million Indians had been
slaughtered in the wake of the conquest, but his detractors challenged
these statistics (Hanke 1949:88-91). Las Casas was a popular and
influential figure at court; an argument from an authority of his
stature could not have been ignored. His accusations and the controversy that followed resulted in an increased interest on the part of the Spanish Crown in New World demographic trends.

The Relaciones De Yucatán

The Spanish court, then, found itself constantly embroiled in arguments that interest Mayanists today. In order to gather additional opinions on these arguments and find out more about his overseas possessions, King Philip II circulated a royal decree in 1577 commanding his subjects in each New World community to answer fifty questions concerning local history, customs, conditions and resources. Two of the questions on the list dealt directly with the subjects treated in this dissertation:

Question 5

State whether the district is inhabited by many or few Indians and whether in former times it had a greater or lesser population; the causes for the increase or diminution and whether the inhabitants live permanently together in regular towns or not.

State also what is the character and condition of their intelligence, inclinations and modes of life; also whether different languages are spoken throughout the whole province or whether they have one which is spoken by all (Cline 1964: 365-366).

Question 31

Describe the form and construction of their houses and the building materials for them that are found in the town or other places from which they are brought (Cline 1964: 369).

Many of the answers to these queries from Yucatán were published in a set of volumes called the Relaciones De Yucatán (1898, 1900). The collections contain a great deal of primary documentary
data that are constantly cited in the debates over Maya culture history.

The Sixteenth Century Population Decline in Yucatán

A drastic population decline in Yucatan is reported in the Relaciones; many of the answers to question five state this directly. Comparison of the demographic data in the reports with earlier lists made in 1549 for the purpose of estimating the amount of tribute that could be extracted by Spanish colonists shows that most communities lost at least half of their population during the thirty years between the estimates (Gates 1937:142). The report of Juan de Urrutia for the pueblos of Chancenote, Chuaca, and Chechimila, all in the Valladolid area, is an excellent illustration (Relaciones De Yucatán 1900:61-76). The Audiencia of Guatemala assessed Chancenote in 1549 with an annual tribute of 600 mantles of cloth, one for each of the 600 married heads of households in that community. Only 200 heads of households remained in 1579; Juan de Urrutia, who held the encomienda rights to tribute from this pueblo, could only extract from them a levy of 200 mantles. Chuaca held 200 heads of households in 1549; their tribute was 200 mantles at that time. When the Relación was written, the assessment had to be reduced to 13-1/2 mantles. Chechimila, however, seems to have been one of the very few places that actually gained in population during the thirty years. Its encomendero wrote that this was because it did neither undergo "civil congregation" an important idea discussed at length below; nor did its people have to toil in the building of elaborate monasteries for the Franciscans. The population decline, then, is often believed to have been caused by civil congregation and forced
Civil Congregation and Related Problems

Throughout the sixteenth and early seventeenth centuries, Spanish officials pursued a policy of civil congregation. This was a systematic program of resettling the Indians in new communities (Simpson 1934; Cline 1949). The Spanish Kings were concerned because many Indians were living in dispersed hamlets far from the direct influence and control of their conquerors. The Laws of Burgos, written in 1512, stated that Indians returning to their native communities, after learning something of Spanish Catholicism and civilization through service with the colonists, reverted to their former "idleness and vice" (Simpson 1950:32). These laws were the beginning of a number of similar ordinances dealing with civil congregation for the purpose of changing this situation by having the Indians resettled close to Spanish colonists and missionaries.

The new communities to which the Indians moved in the process of civil congregation were to be orderly towns with streets laid out in a grid system around a central plaza. This ideal plan, derived from a Mediterranean tradition even older than that of the Romans, was an important part of rational sixteenth century architectural theory. By 1513 specific instructions were being sent to officials in central Mexico ordering the erection of such gridded model towns (Stanislawski 1946; 1947:96); similar instructions flowed from Spain to the New World through the sixteenth century. Laws related to town planning were codified by 1573 (Nuttal 1921) which explains the nearly uniform pattern of many present Central American towns.
Ecclesiastic authorities were the most outspoken supporters of the plans for civil congregations, especially in the early days of the Spanish Empire. Churches were to stand in the plazas at the heart of the new communities, dominating them and facilitating the instructions and conversion of the concentrated populations. Even Las Casas, the Protector of the Indians, was instrumental in the formulation of plans that included total reorganization of Indian communities (Hanke 1949: 56-58). Other officials and some colonists believed that military control and economic manipulation would be easier with the Indians settled in the new towns (Chamberlain 1948:383).

Many Spanish colonists opposed civil congregations and other social ventures of the missionaries among the Indians. Most of these colonists held temporary rights to collect tribute in the form of labor and goods from the Indians in specified native communities. The grants (encomiendas) were given by the King in recognition for services to the crown during the conquest. The encomenderos who held the awards constantly lobbied the crown for extension of these rights in perpetuity, hoping to transform the grants into feudal fiefs (Hanke 1949:86-87). Numerous churchmen, like Las Casas, advocated complete abolition of the encomienda system, viewing it as an evil institution unjustly forced upon the Indians. The movement of people from communities controlled by a single encomendero to larger towns that included Indians from several encomienda grants must have been viewed as a direct attack by the militant friars on the rights of the colonists. Soon it was the encomenderos who were levying charges of cruelty against the churchmen, complaining that
the Missionaries were forcing the Indians to build new towns and huge churches (Ancona 1889:70-72; Gates 1937:145-149).

The main administrative effort towards civil congregation in Mexico as a whole took place between 1603 and 1605 (Cline 1949:355). Attempts to concentrate the Maya population of Yucatan, however, began much earlier, almost as soon as the first Franciscan missionaries arrived in the province. Royal orders regarding congregation were evidently sent to Yucatan in 1548. These orders stated that the dispersed houses of the Maya afforded them privacy for drunkenness, idolatry, and human sacrifice. The royal order or "Cedula que los Indios viuan in calles" commanded the Indians to arrange their houses along planned streets (Sánchez de Aguilar 1892:38,111). But orders like these did not seem to meet the approval of many encomenderos in Yucatan. According to Ancona, (1889:71-72) one of the secular officials ordered a new community, founded by the missionaries near the convent of Valladolid disbanded. This seems to have been done with the support of the encomenderos.

The Franciscans complained to the Royal Audiencia of Guatemala. In 1552 that body sent an oidor, or judge of the Audiencia authorized to hear and decide lawsuits, to Yucatan on an inspection visit (Tozzer 1941:70-72). This judge was Tomás López Mendel, who sided with the friars against the encomenderos, suspended the civil government of Yucatan, and composed his ordenanzas, a code of laws that covered most phases of local administration (Ancona 1889:72-74; Scholes and Roys 1938:588-589).

One of the most important provisions of these ordenanzas of Tomás López, quoted below in Spanish, involved civil congregation:
Item, una de las cosas que ha impedido é impide la policía temporal y espiritual de los naturales de las dichas provincias, es el vivir apartados unos de otros por los montes. Por ende, mando que todos los naturales de esta dicha provincia se junten en sus pueblos, y hagan casas juntas, trazadas en forma de pueblos, todos los de una parcialidad y cabecera en un lugar cómodo y conveniente, y hagan sus casas de piedras y de obra duradera, cada vecino casa de por sí, dentro de la traza que se le diere, y no siembran milpas algunas dentro del pueblo, sino todo esté muy limpio y no haya árboles, sino que todo lo corten, sino fuere algunos árboles de fruta, so pena, etc. (Ancona 1889:540).

According to Relaciones sent to the Crown by the colonists from the region around Valladolid, the ordinance cited above was enforced by burning the old villages of the Indians, cutting down their fruit trees, and compelling them to settle in new locations. This type of brutality was widely believed to have been the cause for the population declines witnessed by the Spanish. The encomenderos believed that civil congregation, Tomás López, and the Franciscan Friars were responsible for the high mortality indicated by comparison of census data collected in 1549 and 1579 (Relaciones De Yucatán 1900:187, 209-210; Gates 1937:138-156; Tozzer 1941:70-72).

Other interesting theories about the population decline are in the Relaciones. One writer explains that the Indians were dying simply because of discontent over prohibitions against drunkenness and idolatry. Another encomendero blames fate. One very popular theory in the reports concerns the drinking of balche, a native alcoholic beverage believed by many colonists to possess exceptional medicinal qualities. The drinking of balche had been forbidden by missionaries because of association with pagan ritual. But because their medicine had been taken away, the Maya could not keep their health. Another prohibition imposed
by the Christians was a ban on polygyny; the resulting reduction in access of Maya males to females is also cited as a cause for the population decline. One report states that the population decline was especially severe in coastal communities because the people ate bad foods like fish without enough salt.

The explanations in the Relaciones were part of popular thought in Yucatan during the late sixteenth century; the fact that all these conflicting ideas co-existed shows that the reasons for the population decline were not obvious. Perhaps it is fairest to conclude from these theories that the Spanish were completely confused about the cause(s) of the population decline. Overall the Relaciones seem to indicate that the colonists did not know or understand why the Indians were dying.

Modern scholars single out for particular attention the theory linking civil congregation with the population declines of the sixteenth century. The origin of this idea in the partisan politics of the squabbling Spanish factions should have made most scholars very hesitant about accepting it. Still, this idea is the impetus for two recent propositions. First, Sanders (1962:92-93; cf., Sanders and Price 1968:195-196) cites the population decline after civil congregation as dramatic evidence for the utility of a dispersed settlement pattern for swidden farmers. Second, several scholars believe that a process similar to civil congregation may have taken place in various parts of Mesoamerica in Pre-Columbian times. If this is true and Sanders is correct, we could expect similar results, i.e., a population decline, to have resulted. George Cowgill (1964) believes that such a process brought about the Classic Maya collapse.
Cowgill (1964) considers forced resettlement of the lowland Maya by Mexican invaders at the end of the Classic stage to have been the cause for the abandonment of the Classic Maya sites in the Peten. He accepts Sanders (1962b:99-100) contention that towns are not compatible with the agricultural practices used by the lowland Maya. The urban settlement patterns characteristic of central Mexico since the rise of Classic Teotihuacan could not exist in the lowlands because these patterns were not compatible with swidden technology; therefore when this form of community was imposed on the Maya, first by the central Mexicans and then the Spanish, population declines ensued. A process like civil congregation then caused the Classic Maya collapse.

Several questions can be raised by the hypothesis suggested above. To begin with, sixteenth century sources like Torquemada (1969:686-690) report that civil congregation also brought about a population decline in central Mexico. Here the argument seems to have stemmed from slighted ecclesiastic officials accusing the civil government of cruelty in the concentration of populations (Simpson 1934:35; Cline 1949:352-354). Moreover, Kirchoff (in Tax 1952:116) suggests that the barrio pattern of community organization so characteristic of Mesoamerica may be a result of Pre-Columbian congregation in Postclassic central Mexico. Sanders and Price (1968:167-168) have found archaeological evidence for such an occurrence. They speak of data indicating "an organized program of enforced nucleation of scattered rural population into planned nucleated villages and towns in the Central Plateau" during the final phases of occupation at Teotihuacan. At that time there was also a heavy population loss (Sanders and Price 1968:
150-151). Did civil congregation also bring about the collapse of that hydraulic state? But Sanders and Price cite the relationship between civil congregation and population decline in the Maya lowlands to illustrate a contrast—namely, the futility of urbanism in the lowlands given a slash-and-burn horticultural system compared with the presence of urbanism in Classic Stage central Mexico sustained by intensive cultivation. Yet their evidence shows that civil congregation was accompanied by population decline in both areas rather than contrasting results. The two arguments seem to contradict each other.

Another factor entering into the arguments linking population declines with civil congregation is evidence indicating only a small portion of the population was actually affected by the Spanish-directed relocations. Cline (1949:366-367), in an examination of the relationship between mortality rates and civil congregation in central Mexico, estimates that only about 12 percent of the total Indian population was affected during the big efforts for congregation between 1598-1606. He concludes that the calculations attributing a million or more deaths to congregation are too high. There is similar evidence in Yucatan. According to Pedro Sánchez de Aguilar (1892:38, 111), civil congregation remained a goal in Yucatan during the first part of the seventeenth century in spite of Tomás López. Writing especially about the region of Valladolid, where charges of high mortality due to civil congregation were most often voiced in the Relaciones, Sánchez de Aguilar complained in a manuscript completed in 1615 that the Indians were spending long periods of time in their milpas without hearing mass and that the royal orders of 1548 commanding the Indians to live in planned communities had
largely been ignored. If this is true, the efforts of Tomás López, like those of the officials attempting to force civil congregation in Central Mexico, must have been superficial, involving only a fraction of the population.

The ideas concerning civil congregation presented in the paragraphs above seem to be quite important to the thinking of many scholars who deal with Maya settlement patterns. This examination of the literature concerning the subject reveals numerous problems connected with these ideas. In my opinion, it is doubtful that the population declines recorded in the sixteenth century Spanish sources can be directly attributed to civil congregation as charged by some of the Spanish factions. Neither can this proposed relationship be considered firm support for the necessity of a dispersed settlement pattern in the Maya lowlands.

**Sixteenth Century Maya Housing and Settlement Pattern**

The second body of information from the Relaciones pertinent to this dissertation is the description of late sixteenth century Maya housing (Wauchope 1934:114-116). Two ideas can be extracted from these descriptions: First, it seems clear that the typical dwelling at that time must have been much like most Yucatecan Maya houses today--small wattle-and-daub buildings with thatched roofs. The report from Tetzal and Temax even contains a drawing of such a house (Relaciones De Yucatán 1898:304). Many of the variations of this simple structure found in Yucatan today were also present then; for example, wattle walls without daub are reported. Short descriptions concerning how the houses
were built also support the conclusion that the houses then and the houses now were very much alike.

Several points are left unclear in the descriptions of the housing in the Relaciones. The ground plan of the houses is not specifically described; and we cannot tell from these records whether the structures were rectangular or apsidal. Both types are used in Yucatan today. Wauchope (1940:236) believes the apsidal type is specifically related to the distribution of Maya populations in Yucatan and Campeche, but he points out that the date of the earliest occurrence of apsidal houses in Yucatan remains questionable. The descriptions of the houses in Yucatan from the Relaciones include little information about the placement of doorways. While a single central doorway is shown in the elevation drawing found in the Relación of Tetzal and Temax, there is no indication that the buildings had a second central doorway on the opposite side as do most Yucatecan houses today. The date of this development, probably concurrent with the arrangement of such houses along streets during congregation, is also unclear.

The second conclusion about Maya housing from the Relaciones is that there was considerable diversity in this aspect of Maya culture. The reports state that some important individuals possessed masonry houses. Some houses had well made floors while others did not. The writings of Landa, described below, tell of a much larger house type with a central lengthwise partition dividing the building. Several doorways are mentioned. This would contrast with the typical house used in Yucatan today as it does with the drawing in the Relaciones.
Many different house types, large and small, seem to have been used in Yucatan during the sixteenth century.

The most important Spanish account of Maya life and society during the sixteenth century is the *Relación De Las Cosas De Yucatán*, written in 1566 by the Franciscan priest, Diego de Landa, second Bishop of Yucatan. Landa's *Relación* contains descriptions of almost every aspect of Maya culture. Their society, according to this source, was divided into three classes: "nobles," "commoners," and "slaves" (Tozzer 1941:62-63). Landa describes the Maya community:

> Their dwelling place was as follows: in the middle of the town were their temples with beautiful plazas, and all around the temples stood the houses of the lords and priests, and then (those of) the most important people. Thus came the houses of the richest and of those who were held in the highest estimation nearest to these, and at the outskirts of the town were the houses of the lower class (Tozzer 1941:62).

These and other statements by Landa are the basis for the traditional interpretation of Maya society best presented by Sylvanus Morley (1915:7; 1946:vii, 159-180), the scholar who dominated the study of Maya prehistory through the first half of this century.

**Interpretations of Sixteenth and Early Seventeenth Century Spanish Documents**

Spanish sources have allowed Mesoamericanists to formulate comprehensive descriptions of native Maya society. The broad outlines of this picture are generally accepted, but certain particulars are still unclear. Many scholars consider descriptions of sixteenth century lowland Maya society the most important source for historical analogies in the analysis of prehistoric Maya sites. Interpretations of the Spanish documents have, therefore, influenced thinking about population
size, pre-conquest urbanism, and indigenous social organization.

Aboriginal demography at the time of conquest. Studies of historical references for the purpose of estimating the size of native populations during the early years of contact have yielded widely divergent results (cf., Dobyns 1966). Las Casas writes that over 4 million people died in Mexico as a result of the first years of the conquest (Rosenblat 1954:101), but many demographers and historians think these figures are highly exaggerated. Kroeber (1939:102), after comparison and reduction of figures in the historical documents, arrives at a population figure of 4.5 million for all of Mesoamerica. According to Kroeber then, there were only about as many people in Mesoamerica as the number Las Casas claimed had died in the wake of conquest. A recent synopsis of the careful and detailed documentary research by Borah and Cook (1969:180) however seems to be part of a trend towards acceptance of the higher figures in Spanish documents; they estimate that the population of central Mexico alone dropped from 25.2 million in 1518 to 1.075 million in 1605.

Interesting implications result from Borah and Cook's (1969:181) comparison of post-conquest mortality rates by ecological zones. By 1568, in lowland areas under 3,000 feet in elevation, the population seems to have dropped to about one-fiftieth of its original size in the base year 1518. During that same time, the inland plateau areas appear to have lost only about a sixth of their populations. According to this analysis, the lowlands in Mexico became a depopulated wasteland as a result of the conquest. While these authors are not speaking directly of Yucatan or the Maya lowlands, their work suggests that this
region once supported a population far larger than one would suspect from an inspection of the number of people in the area today.

Borah and Cook (1969:181-182) believe that the demographic catastrophe of the sixteenth century was in part overdue. They suggest the native population had surpassed the carrying capacity of the central Mexican environment given the indigenous exploitative techniques. Cook (1946; cf., Borah and Cook 1969:182) even considers the Mesoamerican emphasis on human sacrifice, a trait which is usually thought to be maladaptive, to have been an effective population control device in a situation of overpopulation. Borah and Cook (1969:183) interpret the history of population in central Mexico by emphasis upon demographic cycles. Population peaks and nadirs in aboriginal history seem to have taken place every four or five centuries; Borah and Cook even imply that the present population is again approaching a peak. Several authors suggest a population peak during the late Classic Stage in the Maya lowlands. Perhaps a process similar to that which Borah and Cook describe for the central Mexican population in the century after conquest was involved in the Classic collapse.

Ralph Roys (1965:661), the best known American interpreter of historical sources about Yucatan, estimates the population of the Yucatecan peninsula in the middle of the sixteenth century to be 280,000 persons. His main source of evidence is the tribute lists compiled by the Audiencia of Guatemala in 1549. Roys implies the population loss due to Spanish contact up to that time to have been a scant 20,000. If this is true, the demographic picture in Yucatan provides an overwhelming contrast with the situation found by Borah and Cook in the central Mexican lowlands.
Using methods similar to those of Borah and Cook, Lange (1971) estimates the population of Yucatan before the Spanish conquest at 2,285,000. This estimate contrasts with both that of Roys and those of many cultural ecologists like Sanders (1962b) whose figures are derived from estimates of agricultural production (see Chapter VI). Lange admits that his figures indicate a population density far greater than could have been supported by swidden farming as it is practiced today. He suggests heavy exploitation of marine resources as a possible alternative subsistence base for the prehistoric Yucatec Maya.

In part, Lange's research was inspired by the settlement pattern studies at Dzibilchaltun; therefore it is not surprising that the conclusions of this dissertation complement his findings. Both Lange's work and this dissertation support the scholars who are tending towards acceptance of the larger figures in the early Spanish documents.

The Maya community at the time of conquest. Roys (1965:664) also describes the Yucatecan community at the time of Spanish contact, relying heavily on Landa and early census data. He reports the presence of barrios or wards and men's houses at the centers of communities. Roys, while speaking of at least towns in aboriginal Yucatan, agrees with many contemporary students in suggesting that much of the population lived in small dispersed hamlets.

S. W. Miles (1957a, 1957b:768-769) studied the sixteenth century documents relating to the towns of the Pokom Maya in the Guatemalan highlands. These communities were large in area and low in population density. They seem to have had at least some of the characteristics most commonly described by ethnologists studying modern
communities in the Guatemalan highlands. The terms "concourse center" (Borhegyi 1956b:105) and "vacant town" (Tax 1952:48-49, 56-57; cf., Bunzel 1952:3-7), both derived from community studies in the highlands, are much like the concept of "extended boundary towns" used by Miles (1958, cf., 1957b:769) to describe analogous sixteenth century Pokom towns, Greek city-states, and the Classic lowland Maya centers. These she considers urban but not "cities" in the sense of heterogeneous and large densely settled communities:

Town development was moderate; it reached beyond a purely military and religious concentration, so characteristic of the 'urbs' of the 800's in Western Europe, but had not attained the urban features of heterogeneity and size or lost kinship base on territorial organization.

Only two features prevent defining the Pokoman political system as feudal in type: the absence of clear statement that lands were awarded for military service and the presence of a council of elder principales. The incipient organization of provinces with subsidiary lords obligated to an overlord for tribute and military assistance was on the way to full-fledged feudal development (Miles 1957b:778).

Use of the vacant town, concourse center or extended boundary town models in studies of the lowland Maya centers is perhaps strengthened by Kirchoff's (Tax 1952:68) suggestions about the origin of this form of community. He considers the characteristic market, which seems to be one of the most important features associated with this kind of settlement pattern, to have developed in areas where highlands are adjacent to lowlands. In places further from areas of ecological contrast, the markets seem less strongly developed. The implication is clear that the extended boundary town may not have been necessarily confined to the highlands.
Maya social organization during the early sixteenth century.

Records concerning the social organization of Yucatecan society at the time of contact have been examined by many scholars. The household during that period usually consisted of some sort of an extended family averaging between 7.5 and 11.5 members (Roys, Scholes, and Adams 1959:205). Landa (Tozzer 1941:41, 101; cf., Murdock 1949) clearly describes a matrilineal post-marital residence pattern. A 1583 census of Pencuyut in central Yucatan showed that males and occasionally females brought their spouses to live at the homes of their families of orientation after marriage, but the tendency toward patrilocal residence was pronounced (Roys, Scholes, and Adams 1959:204).

Documents describing households of the Chontal Maya in the nearby lowlands of eastern Tabasco provide a distinct contrast with sixteenth century Yucatan; there a strongly matrilocal pattern was present (Scholes and Roys 1948:474). Haviland (1970), however, has reinterpreted the Chontal data, suggesting that the post-marital residence pattern should be considered bilocal. All authors have agreed that the lowland Maya households consisted of more than one nuclear family.

Persons having the same patronymic in sixteenth century Yucatan were considered related even if they were socially separated by differences in wealth or class status. They were obliged to help each other and could not marry. These name groups seem to have been "named patrilineal units with duties concerning marriage, inheritance, and assistance, each with its own patron god, and . . . were not localized" (Haviland 1968b:100; cf., Beals 1932; Roys 1940, 1965:661-662; M. D. Coe 1965, 1966:144-146).
Matronymics were also inherited by certain Maya (Roys 1965: 667-668), especially in the upper levels of society. Writers have debated the significance of this practice; Roys (1940:36-38) and M. D. Coe (1965:104, 1966:144-147) believe that a system of double descent with coexisting patrilineages and matrilineages was in operation, Haviland (1968:101-102) disagrees, emphasizing that the use of such names seems to have been restricted to the upper classes.

Studies of sixteenth century Yucatec kinship terms imply the presence of bilateral cross-cousin marriage and strengthen the case for double descent (Eggan 1934, M. D. Coe 1965:104). Haviland, however, (1968:99-100) rejects the importance of cross-cousin marriage as well as double descent. He points out that this kind of marriage practice produces "small knots of closely in-marrying groups." The opposite situation, many descent groups in any given territory, is described by the sixteenth century Yucatecan literature.

Perhaps the most comprehensive analysis of the ethnohistorical records dealing with Maya social organization was pieced together by Michael D. Coe (1965). Coe examined the "Uayeb" or years end ritual described by Landa, suggesting that this rite was a model for community organization. The ritual revolved about the transfer of religious power from one part of the community to another. The details of the ritual correlate with Coe's interpretation of other recorded facts about social organization:

In summary, there is evidence for some sort of quadripartite division of the ancient Maya community, arranged according to the cardinal directions and with color associations; for the shifting of ritual power among these divisions in a counterclockwise fashion through a cycle of four years; and
for the holding of this power by a different principal each year (Coe 1965:103).

I feel that the Uayeb rites describe a model which could be replicated on increasingly higher levels. The ideal Maya community probably was conceived as divided among four endogamous tzuculs or calpulli, which were wards consisting of exogamous patrilineages. Each ward was associated with a cardinal direction and with a color. Offices within the divisions were ranked like the terraces of a stepped pyramid, the aspirant to office bearing the cargo of any level for one year at great personal expense; the leaders at the top of the pyramid of cargos within each calpulli would have been ah cuch cabs—rich old men, all of whom made up the town council. On the commoner level, the ritual and political leadership of the community rotated through the four divisions in a four-year counterclockwise cycle based upon the permutations of the 52-year time count; the chosen man, called holpop, enforced the authority of the batab or halach uinic (Coe 1965:107).

Coe perceived his model for lowland Maya community structure as compatible with: (1) a dispersed settlement pattern, (2) close analogy to the modern inhabitants of highland Chiapas as suggested by Vogt, and (3) the records of sixteenth century Yucatecan life.

Problems in the evaluation of Spanish works. Thus the value and usefulness of the works of sixteenth and early seventeenth century Spanish authors are readily acknowledged by students of Maya society, but interpretation of these records often presents problems. The sources, like all early documents, have to be understood in their historical and social contexts, for these writings reflect the points of view of particular Spanish individuals and factions. Indeed, as Gates (1934:151) shows, most of the records from Yucatan present the point of view of a particular Indian faction—i.e., a single informant from the Xiu chiefdom, Gaspar Antonio Chi, is credited with aiding Landa in the preparation of his famous Relación, as well as helping to
write seventeen of the reports sent in answer to the questionnaire of 1577. Chi's thinking may also be reflected in the *Informe Contra Idolorum Cultores* of Sánchez de Aguilar (1892:96), for he is mentioned in that work as a teacher of the author. Mayanists, noting the biases that pervade the Spanish works, agree that care must be exercised in the identification of exaggerations made in the Spanish records for propaganda purposes. But early anthropologists of the nineteenth century presented an even more subtle critique of the Spanish writers as they engaged historians in a controversy central to the next important phase in Maya studies.
CHAPTER IV

MORGAN, BANDELIER, AND THOMPSON: PIONEER STUDENTS
OF MAYA DOMESTIC ARCHITECTURE

Interpretation of sixteenth century Spanish documents was the subject of debates between nineteenth century scholars of Mesoamerican history and society including William H. Prescott, Hubert H. Bancroft, Louis Henry Morgan, and Adolf F. Bandelier. The Spanish writers produced manuscripts in their own language and for their own purposes. For this reason, no matter how accurate their observations or keen their insights, their writings in some measure describe native American social forms by analogy to contemporary Hispanic society. The debate between nineteenth century scholars concerns the extent to which the Spanish chroniclers projected their own feudal society in their analysis of native North American social organization.

Literal and uncritical acceptance of these primary sources seems characteristic of the monumental historical works of William H. Prescott (1843) and Hubert H. Bancroft (1875). On the other side, Lewis H. Morgan's ideas about the American Indian led him to attack these works. Morgan's views were derived from two sources; first his ethnological experiences with the Iroquois and other Indian groups in the United States, and secondly, his theories of cultural evolution and the place of the American Indian in that system of theory. Morgan's friend and disciple, Bandelier, collaborated with him in this debate between
nineteenth century historians and anthropologists.

Morgan began the debate with his review of Bancroft's (1875) Native Races of the Pacific States, Volume II, The Civilized Nations. The main points of his argument are illustrated by the following quotations:

The Spanish adventurers who captured the pueblo of Mexico saw a king in Montezuma, lords in Aztec chiefs, and a palace in the large joint-tenement house occupied, Indian fashion, by Montezuma and his fellow-householders. It was, perhaps, an unavoidable self-deception at the time, because they knew nothing of the Aztec social system.

There is even a plethora of empires, kings, and lords in this volume,--for example, the Toltec empire... and the Aztec empire, ... the kings of Tezuco, the kings of Tlacopan, ... and other kings as thick as blackbirds; besides princes, 'nobles, gentry, plebeians, and slaves.'

All the grand terminology of the Old World created under despotic and monarchical institutions during several thousand years of civilization... has been lavished... upon plain Indian sachems and war-chiefs.

To every author, from Cortes and Bernal Diaz to Brasseur de Bourbourg and Hubert H. Bancroft, Indian society was an unfathomable mystery; and their works have left it a mystery still (Morgan 1876:265-268).

Morgan's Point of View Concerning Indians

Morgan thought of American Indian societies as dynamic entities passing through the identical stages of change which characterized the antiquity of every civilized people. He recognized two ideal types of Indian culture: first, the "Roving Indians" of the Columbia Valley, Hudson's Bay Territory, and of all other parts of North America where agriculture was unknown; and second, the "Village Indians" of New Mexico, Mexico, and Central America. Between these ideal types lay a continuum of partly Roving and partly Village Indians such as the Indians east of the Missouri River in the United States. These partially
agricultural and partly hunting groups filled every grade between Morgan’s extremes (Morgan 1869:494-495; 1877:555).

For Morgan, the varying cultural achievements of the North American tribes are added evidence for a universal human history from savagery through barbarism to civilization:

In like manner, the Indian family of America, unlike any other existing family, exemplified the condition of mankind in three successive ethnical periods. In the undisturbed possession of a great continent, of common descent, and with homogeneous institutions, they illustrated, when discovered, each of these conditions, and especially those of the Lower and of the Middle Status of Barbarism, more elaborately and completely than any other portion of mankind (Morgan 1877:16).

The cultures of American Indians present, for Morgan, an important opportunity for research. And the area where research is most necessary, due to misconceptions perpetuated by romantic historians, is Mesoamerica (Morgan 1877:16).

The Mesoamerican tribes, together with the Pueblo groups of the southwestern United States, were passing through Morgan’s (1877:11) "Middle Status of Barbarism." People who had attained this level of development cultivated their fields by irrigation and used adobe and stone in the building of their houses. Essentially, however, the Meso-americans shared many traits with the tribes remaining in the Lower Status of Barbarism:

They still held their lands in common, lived in large households composed of a number of related families; and, as there are strong reasons for believing, practiced communism in living in the household. It is reasonably certain that they had but one prepared meal each day, a dinner; at which they separated, the men eating first and by themselves, and the women and children afterwards. Having neither tables nor chairs for dinner service they had not learned to eat their single daily meal in the manner of civilized nations (Morgan 1877:192).
Thus Morgan thought that the advancement of Mesoamerican peoples had been overrated especially by romantic historians like Bancroft (Morgan 1869:495; 1876:271-273, 277-279; 1877:191). Neither in war nor government were Village Indians much beyond the other tribes of North America, for their institutions were essentially democratic like those of the Iroquois.

Population, social organization, and architecture were key points in the immense compilation of data which formed Morgan's system of theory. Ethnographic facts about these phenomena in aboriginal Mesoamerica could only be estimated from the indirect evidence of Spanish documents which Morgan tried hard to discredit. But the architecture of the Southwest and Mesoamerica remained as direct evidence in the archaeological record attesting the essential status of its creators in terms of social organization and population. Archaeological investigations and ethnological interpretations of these ruins, Morgan believed, would add evidence in support of his system of theory.

**Morgan's Analysis of Maya Architecture**

Morgan's analysis of aboriginal American architecture is found in three places. First, his review of several early Spanish accounts of explorations in New Mexico and several middle eighteenth century American reports of explorations in the same area called "Seven Cities of Cibola" (Morgan 1869) examines the evidence suggesting that the newly discovered pueblo ruins in Chaco Canyon, New Mexico, may have been the place conquered by Coronado in 1540. Continuing this interest in prehistory, Morgan (1880) presented a research proposal for "A Study
of the Houses of the American Aborigines" in order to guide the efforts
of the newly founded Archaeological Institute of America in their New
World investigations. The third source (Morgan 1881), a monograph on
the Houses and House Life of the American Aborigines, was to have been
the fifth part of Ancient Society. All of these works deal at some
length with Stephens' accounts of Maya architecture. Morgan (1876:280)
was impressed enough by the buildings at Uxmal, Sayil, and Palenque, to
consider the Maya the most advanced of all the American Indians.

Morgan's logic in his interpretation of the data provided by
Stephens stemmed from his belief that all human societies at the same
level of development are analogous. If the status of development based
on a few chosen criteria is known, most ethnographic particulars can be
filled in from the observation of other groups representative of the
stage. The Yucatecan natives, Morgan thought, belonged to the same
general stage as the pueblo Indians of the Southwest.

Morgan (1880:46-47) felt that in size and method of construction
the pueblo ruins in Chaco Canyon were comparable with, and perhaps in
some respects even superior to, the ruins of Yucatan and Chiapas.
These southwestern ruins could be interpreted by examination of the
pueblos which were still occupied (Morgan 1880:52). The interpretations,
thought Morgan, could be extended to the ruins of Mexico and Central
America:

Whether the ruins of the Chaco and the towns of Cibola are
identical or not, they are presumptively as old as the
expedition. We recover in them fair and instructive speci-
mens of the architecture of the Village Indians of North
America at the epoch of the discovery of Mexico, which pre-
ceded the expedition of Coronado but twenty years. We find
in these great edifices an original, indigenous, and
distinctive architecture, which is still fully illustrated
by existing edifices in New Mexico, of Indian construction. With a knowledge of the principles and design of this architecture, we possess the means of explaining the architecture of Mexico, Chiapa, and Yucatan. Presumptively, it is one system, founded upon the same social, civil, and economic ideas, but finding its highest development at Uxmal, Chichen-Itza, and Palenque. All this can be made evident by a comparison of structures (Morgan 1869:491-492).

The principles behind the architecture of the modern pueblos, then, were also embodied in the ruins of the Maya lowlands and the Mexican plateau.

The first conclusion reached in this manner by Morgan concerning the ruins of Yucatan was that most of the great buildings of stone were habitations. Bandelier (White 1940 II:1; Morgan 1881:285-286) had evidently convinced Morgan that the architecture of highland Mexico was more diversified than that of the southwestern pueblos and that it was much more like the buildings in Yucatan than the pueblos of New Mexico. Bandelier stated that there were three types of construction at Tenochtitlan at the time of its conquest: ordinary communal houses, larger communal houses with large halls, and, finally, temples. Morgan thought the pyramidal temples were probably analogous to the kivas (called estufas in the early reports cited by Morgan) of the southwestern pueblos. Thus by analogy from the Aztecs of Tenochtitlan he analyzed the ruins of Uxmal:

Among the Aztecs, three kinds of houses were distinguished:
1. Calli, the ordinary dwelling house, of which the 'House of the Nuns' is an example. 2. Ticplantiacalli, the 'Stone House,' which contained council halls, etc., of which the 'Governor's House' is an example. 3. Teocalli, 'House of God,' such as the 'House of the Dwarf.' The estufas in New Mexican pueblos took the place of the last two in Mexico and Yucatan (Morgan 1881:286).
Moreover, the houses that made up the Maya sites were, like the Iroquois long-house and the New Mexican pueblos, communal dwellings, each room of which could hold several related families. Each building in the Nunnery complex at Uxmal could house from five hundred to a thousand Maya in pueblo fashion (Morgan 1880:65; 1881:294).

Morgan (1869:493) perceived two principles in pueblo architecture: the first principle was adaptation to communal dwelling:

The plan of these houses, as well as those of Yucatan, seems to show that they were designed to be occupied by groups of persons composed of a number of families, whose private boundaries were fixed by solid partitions (Morgan 1881:303-304).

Second, the pueblos were built for defense. Similarly the buildings of Yucatan and Chiapas, now considered communal housing for large kin groups, were erected on large sub-structures:

Each structure, or group of structures, thus elevated, was a fortress. They prove the insecurity in which the people lived; for the labor involved in constructing these platform elevations, in part, at least, artificial, would never have been undertaken without a powerful motive (Morgan 1881:304).

Thus Maya ruins shared the characteristics of Village Indian architecture, the germs of which are incipient in the Iroquois long-house of a stage just below that of the Mesoamericans.

Morgan's analogies led to several other conclusions. First, there are no lower class tenements found around the modern pueblos. Moreover, housing in communal structures implies equality; therefore, housing for a lower class should not be expected. Just as there were no structures of inferior material surrounding the southwestern pueblos, Maya communities consisted mostly of the great stone houses (Morgan 1881:142, 285).
Morgan (1880:73-76) thus held strong views concerning Maya settlement patterns and the question of pre-conquest urbanism. Morgan thought Stephens' interpretations of Maya ruins as palaces and temples at the centers of cities were clearly untenable, for southwestern and Maya settlement patterns were alike, even to their distribution along rivers (Morgan 1880:57). But the modern pueblos are certainly not the centers of cities:

'Ancient city,' 'Indian city,' 'another city,' 'ruined cities,' 'great cities,' are terms constantly used by Mr. Stephens in connection with these small Indian Pueblos. Every cluster of ruins was once a city of unknown extent, as well as of civilization and refinement, inhabited by a 'mysterious people.' . . . Had Mr. Stephens been familiar with the manner in which the present Pueblos in New Mexico are located, and more especially those now in ruins which were contemporary with the houses in ruins in Yucatan (as on the Rio Chaco, where seven distinct Pueblos are found in the same valley within an extent of ten miles), he would have had no occasion to be surprised at finding Pueblos four miles apart, and no ground for the absurd conjecture that the intermediate district of what he fancied was once one great city was occupied by the common people living in huts. There is no evidence that such a state of society as implied by Mr. Stephens' terms ever existed in Yucatan (Morgan 1880:73-74).

Morgan appears to have been the first scholar to object to the term "city" in reference to the Classic Maya sites.

Morgan's (1880:70-71) examination of the ethnohistorical records with respect to social organization led to the conclusion, quite compatible with his interpretation of the ruins, that the Maya were organized in patrilineal descent groups of the kind he termed gentes or clans:

Assuming the correctness of Herrera's words, it is proof conclusive of the existence of gentes among the Mayas, with descent in the male line. The fact of this organization renders it probable that the apartments in these houses were
occupied by groups of gentile kindred, as the houses of the Iroquois and the Creeks are known to have been occupied. The groups were separated from each other by solid partition walls, but the terraces were common to all (Morgan 1880:71).

The twin phenomena of unilineal kin groups and communal living in "joint-tenement houses was, for Morgan (1881:142), functionally interrelated with a democratic society. He rejected ideas concerning social stratification and hereditary feudal leadership in pre-Hispanic Maya society. According to his thinking property was owned in common and leaders were elected.

Morgan thus created a comprehensive reconstruction of pre-historic Maya society, with integrated interpretations of population, settlement pattern, and social organization. Morgan's account of Maya society was based on a wide range of sources. He employed both historical and cross-cultural analogies in the construction of his theory and constantly emphasized the relationship between technology, material culture (especially domestic architecture), and social organization. Few comparable syntheses of data and their interpretation were to grace the writings of Mayanists or any other prehistorians for the following fifty years.

**Thompson's Test of Morgan's Interpretations**

Morgan's proposal for further research on domestic architecture in Yucatan produced an almost immediate response from Edward H. Thompson (1886, 1892). In a temperate article, he reviewed Morgan's interpretation of Maya society in light of his own observations:

I believe that few, if any, of the structures now standing have been habitations of man, as constant adobes. The massive buildings, built upon still more massive mounds can only be those 'buildings built upon high places,'
spoken of by the chronicler; not merely temples, but halls
of justice and public business . . . . Below were
clustered the dwellings of the multitudes that made these
edifices a necessity. . . .

I am aware that a large number, and perhaps a majority, of
archaeologists hold to the belief that the edifices, not
devoted to religious purposes as temples, were simply communal
dwellings, and within them dwelt all the people that composed
the so-called city. . . . Nevertheless I thoroughly believe
that the dwellings of the people covered a large space of
territory, but in most cases being built of perishable
material they have disappeared. . . . The whole region
around Labna is dotted with low mounds and small rectangular
terraces. . . . Reason would tell us that each of these almost
innumerable small mounds and terraces, that encompass the
region of Labna, and many other ruins, marks the site of what
was once a dwelling-place, - a home (Thompson, 1886:252-253).

A second article continued Thompson's examination of domestic archi-
tecture, settlement patterns, and their social correlates. Reporting
investigations in "over sixty groups of ruins," he (Thompson 1892) not
only presented archaeological evidence for the presence of small
thatched houses of a Mayan lower class, but discussed representations
of such dwellings on the murals at Chichen Itza. Unfortunately, his
archaeological evidence is not described in detail.

Thompson was the first scholar to decry the lack of attention
given smaller domestic remains in favor of overemphasizing excavations
in large spectacular ruins. Morgan and Thompson's interests in
housing and social interpretation of this aspect of behavior antici-
pated some of the newest trends in prehistory. Their arguments
concerning the existence of classes and cities in Maya culture have been
almost replicated within the last few years by distinguished Mayanists
working with the latest data (Ruz 1964; Andrews 1965:300; Willey and
CHAPTER V

STUDENTS OF THE MAYA GREAT TRADITION

The main interest of Mayanists like E. H. Thompson, who helped discredit the evolutionary theory of the nineteenth century was the Maya "great tradition," defined by Redfield (1956:74-75) as:

the hierarchic culture of the Maya with the monumental stone architecture for temples and palaces, the highly sophisticated art, the hieroglyphic writing, compiled arithmetic, astronomy and calendar, the deities not directly associated with the earth or the forces of nature, and the theocratic government.

Exploring large and spectacular sites that fill the lowlands, these men--Le Plongeon, Charnay, Maudslay, Maler, and others--studied palaces, shrines, and temples, elucidating Maya art, literature, and science (Wauchope 1962). With almost mystical fascination they examined the abundant evidence of rich religious ceremonialism in Maya culture. The view of these scholars was the opposite of Morgan's; for them Maya culture was a unique civilization of cities ruled by an elite class of kings, nobles, and high priests.

The emphasis of this school prevades most Maya research today. Two of the influences stemming directly from this tradition in research are particularly pertinent to this dissertation: First, with few notable exceptions, these scholars neglected smaller ruins outside larger ceremonial centers. Even today, in spite of repeated critiques of this neglect by eminent scholars, most effort and energy is expended
on the excavation of monumental ruins while less expensive and potentially more productive studies at smaller structures are disdained. Secondly, due to the influence of students of the great tradition, most scholars seem too ready to assign ceremonial functions to individual ruins and groups of ruins. Not only the large ceremonial centers found every ten kilometers or so in some lowland areas but also numerous other sites between them are thought to have largely been used for religious purposes. It would seem that most Maya architecture was ceremonial in its purpose. These two biases remain problems in the study of Maya prehistory.

**Diffusionist Thought in Mesoamerican Studies**

The students of the Maya "great tradition" seem to have been particularly susceptible to extreme diffusionist thought even before such ideas became popular in anthropological theory as a reaction to Morgan. But the students of "great tradition" data also produced the evidence that in turn brought about a rejection of diffusionism as an all-pervading concept for explaining Maya prehistory.

Explanations of Central American civilization involving lost tribes of Israel, ancient freemasonry, Egypt, Mu, Atlantis, and similar ideas are quite old in Maya studies (Wauchope 1962). Several early Spanish writers thought the Maya to have been descendants of the lost tribes while Brasseur de Bourbourg believed the Maya to have originated on Atlantis. The theory presented by G. Elliot Smith re-echoed the thoughts of the earlier diffusionists in this century as an attack on evolutionary doctrine. After their initial popularity, especially among laymen, and as more information about the time depth
involved in Mesoamerican archaeology became available, the diffusionist theories of Mesoamerican origins were largely discarded.

**Decipherment of the Maya Calendar**

Perhaps the decipherment of the Maya calendar and the resulting achievement of time perspective in Maya studies was the most important contribution of the "great tradition" scholars. This was a momentous event in archaeology. Diligent research that began with Brasseur de Bourbont's finding and publishing of Landa's *Relación* led to the decipherment of these hieroglyphs. Step by step the works of Förstemann, Seler, Maudslay, Goodman, and others arrived at identification of the glyphs for *tun*, *katun*, and *uinal*, and finally the decipherment of initial series dates (Seler 1905; Morley 1920:30; Kelley 1962b:3-12). Equipped with this understanding, archaeologists used the initial series dates inscribed on monuments and buildings in the lowlands to build a fairly precise relative chronology by shortly after the beginning of the present century, long before this was done in other parts of North America by radiocarbon analysis or even dendrochronology.
The discovery that the Classic sites in the Peten district were abandoned and the region depopulated after the ninth cycle in the Maya long count, or between about 600 and 900 A.D. (Andrews 1965:289), was a direct outcome of Goodman's (1897) early attempt to build a chronological framework for the Maya Lowlands from Maudsley's photographs and drawings of hieroglyphic texts on stelae from various sites. Attempting to correlate his findings with the historical accounts given by natives to the Spanish authors of the sixteenth century, Goodman hypothesized at least two migrations from the Peten to Yucatan. The reasons for the migrations were postulated as an intensification of either "invasion by savage hordes," "devastation by earthquakes, tornadoes, or pestilence," or perhaps the most important, "domestic war" (Goodman 1897:145-149). Brace (1967:8-10) traces several current ideas in paleontology to the concept of catastrophism that seems to have been important in scientific thought of the late nineteenth century; one would suspect that the concept played a role in the development of the problem of the Maya collapse. In this context however, catastrophism probably provided a useful viewpoint, for Goodman anticipated many of the subsequent explanations of the collapse including the idea of internal revolt championed by J.E.S. Thompson (1954:84-90) and Borhegyi (1956), and the Mexican invasion recently discussed by Sabloff and Willey (1967).
Early Studies of Swidden Farming

The most popular explanation of the Maya collapse, however, involved agriculture and the interrelationship between man and his environment. The idea was advanced by Orator F. Cook (1909, 1921), an early student of swidden farming, and favored by Morley (1917, 1920, 1946). Cook's principal interest was the role played by man in changing the environment. The Cook-Morley hypothesis suggests that the Maya practice of clearing the forests and firing the felled trees before planting resulted in the formation of large tracts of grasslands around the Maya sites. Unchecked fires from adjacent new fields swept through the secondary growths of grass in older fields, killing small trees; therefore, the land could not revert to forest until it was completely abandoned. Year after year the circle of grassland surrounding the Peten sites became larger. The thick tropical grass could not be farmed by the Maya, so as the nearby forests were consumed by their destructive farming practices, they had to travel farther and farther from the homes to their fields. Inevitably, as the Classic Maya exhausted the land resources in the area of their sites, some and then all of the Indians had to seek other locations for their communities in wooded areas that could be utilized by their system of agriculture.

A related hypothesis that also considered the Maya decline an inevitable result of their destructive and wasteful swidden practices was proposed by C. W. Cooke (1931) and endorsed by O. G. Ricketson (1937:10-13). The shallow basins or swampy ponds that form about half of the land surface in the Peten, according to this hypothesis, were once deep lakes. These ponds or bajos were filled with silt eroded
from the fields cleared by the Maya for agricultural purposes. This process, in addition to ruining the agricultural potential of the land, also turned the once deep lakes into shallow breeding grounds for malarial mosquitoes. Moreover, the Peten now has only clouds as a water source, for most of the bajos with their basins filled with silt dry up during the season without rains. Thus lack of water, disease and crop failure, all due to soil erosion caused by destructive agricultural practices, forced the Maya to move.

The studies listed in the preceding paragraphs seem to have been a powerful stimulus in the rise of cultural ecology as an area of thought in anthropology. Though the theories concerning the Maya fall presented by Cook and Cooke seem to have been rejected by limnological surveys in the Peten (Cowgill and Hutchinson 1963), they did much to inspire a long series of studies concerning the relationship between shifting agriculture, population, settlement pattern, and ecological change (cf., Conklin 1963), not only in the context of the Maya collapse but all over the world.

**Environmental Potential of Tropical Rainforests**

One idea strengthened by the cultural ecology approach to the Classic Maya abandonment of the Peten is the belief that tropical rainforests are unsuited for the maintenance or development of civilization. Western men of science have voiced dismal opinions of life in the unhealthy tropics; indeed such opinions were once quite popular. A French book on the medievial civilizations of Cambodia provides a good example of this intellectual legacy:
The luxuriant fertility of the tropics strangles far more life than it promotes. The soil is steeped in stagnant water, channelled by torrid rains, rotten to the core. Animal life is hostile to man. The atmosphere is charged with electricity, the skies leaden. Everywhere the damp heat drains men of their strength and will-power. This is far from an ideal environment; in it man is crushed rather than stimulated (Groslier and Arthaud 1957:10).

That such a decadent environment would cause the fall of the Maya was a hypothesis first expressed by Ellsworth Huntington (1915, 1917), an environmental determinist who was interested in the relationship between climate and civilization. Huntington believed the disease ridden tropical rainforest was not the original environment of the Maya. Comparing the dates on Maya monuments with the width of rings on California sequoia trees he concluded that a belt of subtropical dryness was pushed south driving the belt of tropical rainfall before it during the time that Maya culture arose. But around 700 A.D. the sequoia of California grew more slowly, indicating that the belt of dryness once again shifted to the north and allowed increased rainfall to create tropical rainforests in the southern Maya lowlands. This not only made it impossible for the Maya to farm in the resultant luxuriant vegetation but also sapped the strength of the Maya "race" through the spread of tropical diseases.

Betty Meggers (1954) reaches a similar conclusion, proposing a "law of environmental limitation" and suggesting that the Classic Maya culture was not indigenous to the lowlands. She believes that after Maya culture was introduced to this area, it underwent a steady decline because the tropical rainforests did not have the agricultural potential for its maintenance. If this is correct, the history of the Maya in the lowlands was one of steady decline and deterioration. Similar
declines had been documented by Meggers for Circum-Caribbean chiefdoms that were reduced to a "Tropical Forest" level in the Amazon basin. Her work seems to have provided support for Steward's (1947; cf., Steward and Faron 1959:290-91; Rouse 1953) "Circum-Caribbean Theory"; an idea that utilized the concept of deculturation to explain in part the development of Tropical Forest Culture in South America. Meggers' law of environmental potential was thus not an entirely new idea in anthropology; instead, it may be viewed as an attempt to make explicit some assumptions that have been very popular in the discipline.

Meggers' hypothesis has been criticized on several grounds, the most important of these being discussions of archaeological evidence indicating the Classic Maya culture was indeed an in situ development in the lowlands (W. R. Coe 1957; Altschuler 1958; cf., Meggers 1957). Ferdon (1959) however, in an article accepting and elaborating Meggers' idea of environmental limitations, pointed out that the agricultural potential of the Maya lowlands is at least as great as that of central Mexico, which Meggers rated as capable of supporting a civilization. Peten soil, according to Ferdon, is one of the better types found in any of the rainforests; and other students (Cunningham 1948:22-23; Cowgill 1960, 1962) seem to concur.

**Economic and Social Consequences of Swidden Farming**

Three assumptions seem to have been basic to the thinking of Cook, Cooke, and perhaps Meggers. The first is that swidden cultivation is wasteful and destructive. Slash-and-burn farming, especially if it is practiced by a sizeable population, overtaxes the soil and may even change the floral complex. Second, swidden agriculture is not
productive enough to support large or dense populations. Even if a balance between land in use and land lying fallow can be struck, large tracts of land are necessary for such a system; therefore, population density cannot be great. The third assumption is that large and permanent communities cannot be maintained by shifting cultivation. When available land resources are used up in the region near a community, the architecturally small and simple settlements characteristic of the rain forests move to new locations nearer to the fields. Swidden farmers utilize vast amounts of land. Therefore, concentration of swidden farmers in a single community far from their fields would be inefficient for they would have to spend much time and energy in travel. Thus swidden farming tends to be centrifugal (Wolf 1959:60), producing a settlement pattern of small dispersed hamlets. There is no general agreement about these three assumptions, however. The relevant studies are cited below.

Opinions vary about the amount of destruction caused by swidden systems. Bartlett (1956) and Budowski (1956, 1959a, 1959b) have reaffirmed Cook's position that man's use of fire in primitive agriculture brought about severe ecological changes and deterioration in tropical lands around the world. Replacement of the forests by grasslands due to swidden practices set natural limitations to agricultural occupation of tropical areas; Bartlett (1956:694-695) cites the Maya decline as one of his prime examples of this process. Several other writers, however, have denied that savannas are man-made and that swidden fields are invariably invaded by grass (Emerson and Kempton 1935:139-140; Hester 1953:291; Cowgill 1962:278). Conklin (1957) even
showed that some systems of shifting cultivation achieve a harmonious state of integration with their environment. Working with a swidden technology in the Philippines, Conklin emphasized the fact that some aspects of such well integrated swidden systems can be considered conservation-minded.

The Carnegie Institution of Washington sponsored several studies of shifting cultivation in the lowland Maya area. Most of these studies revolved about the twin themes that have characterized such research the world over--productivity and carrying capacity of the land in terms of population density (Conklin 1963:5). The definitive study of swidden farming in the Maya country was Moris Steggerda's (1941:89-152) summary of eight years of research on swidden practices in Yucatan. Steggerda found that Maya swidden farmers work only 190 days in their fields, leaving a large amount of time free for non-agricultural pursuits. According to his data, 100 farmers utilizing 24 square kilometers of good agricultural land, could permanently grow enough maize to feed close to 400 families of average size, a total population of about 2,000 (Steggerda 1941:116, 127-130). The statistics cited do not include corn for the feeding of livestock other than a few old tortillas for family cats and dogs. This estimation of the productivity of swidden systems in Yucatan is quite high; Steggerda estimates the carrying capacity of the land with the present agricultural system to be eight times the population density in 1940.

Emerson and Kempton (1935:139; Emerson 1953:58-59) were two agronomists collaborating with Steggerda in 1935. They suggested that weed competition rather than soil depletion was the cause of declines in
the yields of re-used swidden fields. They also thought that weeding swidden fields for repeated uses, though quite time consuming and inefficient today, may have been much more practical before the introduction of steel tools made the felling of new milpas easier. Following these suggestions, Steggerda performed a number of experiments to determine yields under different conditions. He (Steggerda 1941:117-124) found that a hand weeded milpa near Chichen Itza would produce good yields for seven or eight years. Modern weeding practice often takes as long as clearing a new field, so the fields are usually abandoned after the second year. The weeds are cut with a machete in Yucatecan swidden fields today rather than having their roots pulled out as in Steggerda's experimental milpa. Steggerda's experiment indicates that if the ancient method of weeding was by pulling up unwanted vegetation by hand, the fields were probably moved less frequently. Consequently, less land could have supported a much larger population in prehistoric times.

Another experiment concerning the feasibility of swidden cultivation in prehistoric times was performed by Joseph Hester (1952, 1953, 1954). Hester's workers cleared fields near Mayapan in Yucatan using unhafted tools made from broken pieces of limestone. Felling and clearing those fields took only about twice the time necessary when steel tools were used. Moreover, Hester (1953:290) believed the time consuming labor of constructing a fence now necessary for protection of fields from cattle and other animals, may not have been needed prior to Spanish introduction of the creatures.
The Carnegie Institution's studies of shifting cultivation concluded that swidden horticulture was highly productive. Moreover, a modified form of intensive swidden cultivation could have supported an even larger population. All of the studies denied that the swidden system of the lowland Maya was destructive; the research indicated that such a system could support a relatively large, permanent stable population with swidden fields lying fallow for six to eight years.

Agronomist Perez Toro's (1946) study of milpa agriculture in Yucatan seems less optimistic than the Carnegie studies. He estimates that the most industrious Maya farmers situated in the zones where maize is grown today spend about 226 days working in four hectares for the production of 2,800 kilograms of maize. More frequently however, only three hectares are planted resulting in a harvest of 2,100 kilograms. The average family consumes about four kilograms of maize per day; therefore between 640 and 1,340 kilograms are produced in excess of annual domestic consumption. This means that each farmer can support his family as well as produce enough maize for from about 40 to 90 percent of the needs of another family. However, part of this excess must be saved for seed, while much of the remainder is now used to feed domestic animals that were introduced by the Spanish. Production of corn per unit of time and per hectare is, according to Perez, considerably lower in the area of north Yucatan where henequen plantations are now located; this of course includes the region around Dzibilchaltun.

Chardon (1961:135-136) was told by workers at Komchen, a pueblo within the archaeological zone of Dzibilchaltun, that a plot of land
20 meters long and 20 meters wide would yield only 10 kilos of maize. This would be an extremely low yield in comparison with other areas of Yucatan. If it is a close approximation of the yields in the area of Dzibilchaltun, the carrying capacity of the land there is only about eight persons per square kilometer. If a family of five needs 30 kilos of maize per week, a square kilometer of milpa would produce enough corn for about 80 persons for one year. A ten-year swidden cycle would require 10 square kilometers to sustain 80 persons permanently. Thus, using Chardon's figures, one may calculate that all of the land within a radius of approximately 7.7 kilometers would be needed to support the 1,500 people living in Komchen alone if they made their living primarily from swidden corn production. Under these conditions a community of 10,000 would require all the land within about 20 kilometers radius in order to be sustained. Under such conditions a nucleated community with a population of that magnitude would truly be an inefficient choice of settlement pattern for swidden farmers. They would have to expend far too much energy in travel between their homes and their fields.

Ursula Cowgill (1961, 1962) studied many of these same problems in the Peten. She concluded that swidden agriculture appeared to be the most efficient exploitative system possible given the present environment. Another conclusion was that the Peten could support a much larger population density than Yucatan. Ruben Reina (1967) however, found that Cowgill's estimates of the Peten's productivity were too high. His ethnological account of swidden cultivation in an isolated Peten community is a picture of recurrent food shortages and famine. He also questioned conclusions drawn by many students concerning the amount of
leisure time available to the swidden farmers for pursuits other than food getting; according to Reina's data, the Peten farmers had to engage in numerous other economic activities such as chicle gathering in order to make ends meet. But Haviland (1968) questioned the relevance of this research by suggesting that social organization including extended families and a political leadership with the power to coerce the Peten farmers would enable even the atypical Peten farmers studied by Reina to produce a surplus. Reina (1968) replied to each of Haviland's arguments, agreeing only that more long term studies of swidden farming are needed in the Maya lowlands.

Numerous estimates of the Pre-Hispanic population have been attempted from examinations of the agricultural potential of the Maya lowland areas. With the view of culture as an adaptive mechanism, it can be reasoned that a population once introduced to a new region will rapidly increase to the maximum carrying capacity of the environment. Once this population level is reached, the number of people per unit of land will stabilize until disturbed by changes in either the adaptive mechanism or the environment.

Assuming that the ancient Maya environment and subsistence techniques were not much different from those of today, students have made population estimates based on agricultural statistics. Sanders (1962b:92-94) indicated that the population of Yucatan before the conquest may have been twice the size of the rural population of the state as it was in 1940. Brainerd (1954:78-79) however, reasoned that because Yucatan imported little food, the land could have probably supported twice the entire population it now does before henequen plantations.
that produce no food covered the northern part of the state. Steggerda's (1941:149) study, already cited, concluded that eight times the present population could have been supported by swidden farming.

Estimates of the carrying capacity of the land in the Maya area today range from about eight persons to 40-80 persons per square kilometer. The former estimate is derived from Chardon's (1961:135-136) data from the area around Dzibilchaltun. Hester (1953:290) made an estimate of 11.6 persons per square kilometer based on his studies of the swidden system in Yucatan. Ursula Cowgill (1962:283), whose studies, though challenged, seem particularly rigorous, made the high estimation for the Peten region, conceding that the carrying capacity of the northern lowlands was considerably lower. Morley (1946:151) estimated 18.2 persons per square kilometer; Emerson and Kempton (1935:140) arrived at 23.2 persons per square kilometer, and Sanders (1962:95) reached a figure of 30 persons per square kilometer.

The estimates above are based on the proposition that Maya environment and subsistence have remained the same through many centuries. Wagner (1969:183-184), however, believes that swidden horticulture was unknown among the Maya of Pre-Columbian times. That there was a very important change from aboriginal implements to steel tools after the conquest is a certainty. Other changes have probably taken place as well. Wolf (1959:77-78) thinks that the dispersed population produced by swidden systems could not have been organized and controlled by officials in the Maya centers; he suggests that the Maya possessed some form of intensive cultivation, perhaps a system of floating gardens such as used on the central Mexican plateau. Moreover, the researchers
that produced the density figures above have relied for the most part on
figures of corn production, for the studies by Steggerda (1941:127-130)
and others indicate that corn forms the largest part of the Maya diet.

Lundell (1933:68), Higbee (1948:460), Emerson (1953:56), and others,
however, all stressed that other crops such as beans are usually inter-
planted with corn in the Maya swidden fields, thus raising the carrying
capacity of the land. Bronson (1966) compiled the evidence for
extensive use of highly productive root crops by the Classic Stage
Maya, a proposition that was also entertained by the British Honduras
Land Use Survey Team (Wright, et al. 1959:114-115). In addition,
Thompson (1930:185), Cook (1935), Lundell (1937:10), Barrera Vásquez and
S. Rendón (1948:107-108), and Puleston (1971) have all thought that the
Classic Maya may have eaten large quantities of the sweet fruit and
starchy seed of the ramon or breadnut tree, *Brosimum alicastrum*, due to
the distribution of these trees near Maya ruins. The role of other
plants in the ancient Maya economic system could also have been quite
significant. The lowly pigweed (amaranth), for example, seems to have
held a very important place in Mesoamerican history and religion. Its
economic importance however, seems to have been largely underestimated

These studies suggest that the Maya economics of the past may
have been somewhat different than the system as it exists today. If
this is so, estimates of the carrying capacity of the land based on
modern economics would have to be modified before they could be
projected into the past. Lange (1971) also arrives at this conclusion;
his estimate of the size of Yucatan's population at the time of conquest
based on documentary data is considerably larger than any of the estimates based on agricultural production.

The size and permanence of villages that can be supported with a swidden system has also been a problem for both ethnologists and prehistorians in the past two decades. In spite of Forde's (1934:380-381) statements about the variety of settlement types found in the tropical forests, the concept of a dispersed settlement pattern seems to have prevailed in Maya studies. Linton (1940), for example, believed soil exhaustion and weed growth to be so rapid in tropical rain forests that large nucleated villages would have had to be moved every two or three years. Elsewhere he implied that Southeast Asian swidden farmers, having to move periodically due to rapid soil exhaustion and the encroachment of weeds and grass, built prefabricated wooden dwellings that could be taken apart and reassembled in new locations (Linton 1955:100). This was an extreme statement of the premise that slash-and-burn farmers live in small shifting communities. Linton's interpretation of the social significance of swidden farming was widely accepted among the modern Mayanists, and certainly influenced their thinking. Similar views were accepted by many anthropologists at that time. The effects of positions taken by these scholars on interpretations of Maya society are examined below.

Brainerd (1956) thought that the Maya of the Classic Stage lived in dispersed settlements that perhaps consisted of only nuclear families; these communities certainly numbered fewer than 50 inhabitants. His interpretation of the archaeological evidence was tempered by the general view of milpa agriculture:
The necessity for a dispersed habitation pattern among slash and burn cultivators has long been known. The Yucatan Maya rotate land use, keeping only 1/5 to 1/6 of their land under cultivation at any time. Thus Maya farmers must live in aggregates no larger than villages to allow them to walk to their fields. The cycle of land use returns each plot to cultivation as often as every 12 years, thus making constant change in habitation uneconomical with the type of housing known to have been used by the Maya (Brainerd 1956:162).

Sanders seems to present the clearest statement of the position that swidden systems tend to result in dispersed settlement patterns:

It is maintained here . . . that the primary determinants of rural settlement patterns in a peasant society is the agricultural system practiced. . . . For any system of agriculture obviously the most advantageous settlement pattern in terms of work convenience is one in which each farmer resides on his holding. However, there are nearly always other factors that tend to make this type of settlement pattern a rare one (kinship ties, larger socio-political institutions, warfare, or a specific desire for socialization) so that in most peasant societies farmers live in residential communities exceeding in size the family. From studies completed by the author in the Valley of Mexico, Tabasco, and Yucatan there seems to be a very close correlation between the intensivity of agriculture and the size of the community. . . . Slash and burn agriculture with its need of large areas of land in rest for each area in cultivation would seem to correlate with a completely dispersed settlement pattern or one of small hamlets (Sanders 1962b: 99-100).

The positions listed above have not remained unchallenged. Chang's (1958:306, 309-310) survey of 53 neolithic societies including a number from the tropical forests of South America, encountered only one group with settlements consisting of dispersed households living near their fields. Chang specifically rejected Brainerd's contention, quoted above, concerning the direct relationship between swidden farming and dispersed settlements. Moreover, he argued that even if the farmers must be dispersed, non-food producers need not be. As shown above, studies of swidden horticulture have generally concluded that the
slash-and-burn system in the Maya lowlands could support a large population that need not farm at all. Such specialists would most efficiently be housed in nucleated communities.

Carneiro (1960) has also examined the size and permanency of villages in the tropical forests. After learning that the Kuikuru of the Upper Xingu river area in central Brazil maintained their villages in much the same place for almost a century, he inspected the agricultural potential and found that permanent villages of over 2,000 people could be supported by the land in the locality. Even in very low yield areas communities of nearly 500 people could remain completely sedentary. Moreover, he suggested that if evidence for relocation of such small communities is encountered, "causes other than soil depletion should be assumed to have been responsible unless there is clear and conclusive evidence to the contrary" (Carneiro 1960:233). While both Chang and Carneiro object to the notion of dispersed and shifting settlement patterns for swidden farmers, neither suggests that communities of urban proportions could be supported in such a manner.

The Wittfogel Hypothesis and Related Ideas

The ideas of Karl Wittfogel (1938, cf., 1955, 1957) and their elaboration by Julian Steward (1949, 1955) have provided considerable impetus to the corpus of thinking supporting those who contend that tropical lowlands are not suitable for the development or perhaps even the maintenance of civilizations. Wittfogel emphasizes the role of irrigation in the development of hydraulic or "oriental" societies characterized by large scale public construction, the organizational
and acquisitive features necessary for such construction, a weak concept of private property, and a bureaucratic elite that monopolized all aspects of religious and secular leadership. Steward explained the development of societies up to the threshold of "Regional Florescence" or late Formative to early Classic level in a similar manner. Speaking of the rise of civilizations in arid and semiarid environmental situations, he noted:

Since the centers of early civilizations in the Near East, China, Mesoamerica, and the Central Andes are extremely arid, large-scale agriculture and a dense population were possible only if irrigation agriculture were practiced. The Era of Incipient Agriculture was a time of independent farm villages. Later, when several villages cooperated in the construction of irrigation canals, supra-village authority patterns became necessary. It was postulated that this authority was assumed at first by a priesthood, since there was little or no evidence of militarism in these areas, and that small, theocratic states began to emerge during the Formative Era. As irrigation expanded and the population increased, the states entered a Florescent Era, when special artisans devoted full time to the production of fine esthetic products in metals, ceramics, textiles, and other materials that were used largely by the priestly class in its ceremonial function, when the largest and best constructed religious centers were created, and when calendars, writing, mathematics and other intellectual fields were developed (Steward 1955:2).

The presence of what has been considered civilization in the archaeological record of the Maya lowlands, a region not usually considered arid or semiarid, has been a problem in the formulations of Wittfogel and Steward. Wittfogel (1955:46, 49; 1957:184-188) considered the Classic lowland Maya a "Marginal Hydraulic Society," whose despotic social and political aspects developed as the result of diffusion from a core hydraulic area, presumably the Mexican highlands. Steward (1949:17) acknowledged that the Maya lowlands slash-and-burn technologies and settlement patterns probably indicated a process that
contrasted with the highlands. He too favored the idea that civilizations in the lowlands were at least in part derived from the irrigation societies in the highlands. Later, Steward (1955:63-65) hypothesized that control of trade by the theocratic elite rather than irrigation may have been the principal factor in the rise of Mesoamerican "Ceremonial Trade States" or "Ceremonial Monopoly States."

William T. Sanders has become a leading advocate of the Wittfogel hypothesis as an explanatory device for the rise of urban civilizations in Mesoamerica. He believes that the societies in the Maya lowlands provided a strong contrast with those of the central Mexican plateau with respect to agricultural technology, population density, settlement pattern, and social and political complexity. The larger and denser highland populations in central Mexico, together with their advanced states and true urban centers were the result of greater evolutionary potential of hydraulic agriculture relative to the initially more productive swidden systems of the fertile lowlands (cf., Sanders and Price 1968:134; Sanders and Marino 1970:53).

Objections to Sanders' views have been articulated by Robert M. Adams (1966:38-78; cf., Sanders and Price 1968:183-187) who points out alternative ecological inducements for urbanization. Specifically, he questions the importance of irrigation in the Mesoamerican highlands during the critical periods of urban development and endorses Stewards' (1955:63-65) ideas on the role of commerce in the development of Mesoamerican states. The studies of population in Mexico using ethnohistorical sources by Borah and Cook seem to be incompatible with particulars of Sanders and Price's thesis (Borah and
Cook 1969; cf., Sanders 1966; Sanders and Price 1968:84). Though the data in this dissertation lead me to believe Sanders' contrasts between the highlands and lowlands are overstated in detail, I must admit that much of his argument will probably stand the test of scholarly examination.

**Palynological Evidence for Ecological Change in the Maya Lowlands**

The potentially most important new evidence bearing on ecological studies of the ancient Maya is the palynological data from the southern Maya lowlands. Tsukada's (1966) analysis of cores taken from Laguna de Petenixil provides direct evidence of significant environmental changes in the recent history of the area (Tsukada, et al. 1962; Cowgill and Hutchinson 1963, 1966; cf., Adams 1969:18). Sediments deposited in the bottom of the lake during the period that the Peten Maya evolved through their Formative and Classic Stages contain abundant oak, pine, weed and grass pollen. After the Classic Maya abandoned the region, tropical forest types dominate the pollen complex, with little weed or grass pollen represented. Interpreters of this evidence conclude the Maya civilization evolved in an environment characterized more by grasslands or savannas than by the rainforests of today. Additional data from other areas in the Maya lowlands will help complete this picture of environmental setting through time. While there is yet a lack of data from the northern lowlands, cores taken from Laguna Chichancanab and other places in Yucatan by Alan Covich of Yale University will help supply this needed information.
The implications of the pollen history of the Peten have yet to be explored in detail. Obviously the Cook hypothesis involving invasion of swidden fields by weeds and grass would be rejected on the basis of this data for grass precedes rainforest rather than visa versa. Note that Meggers' contention that the Maya civilization did not develop in tropical rainforests seems to be substantiated by the palynological data. Moreover, the growth of tropical rainforests may indeed have been involved in the collapse of Classic Maya civilization; at least this growth and the collapse seem to have occurred at about the same time. The subsistence activities of the ancient Maya must have been considerably different from what they are today. Cowgill and Hutchinson (1966:123) indicate the Maya farmed in the savannah, but Michael Coe (1966:40) suggests they tilled the scattered patches of rainforest and avoided the savannahs. If so, their environment was even more limited than it is today; it seems more likely that ancient Maya exploitative techniques were not like those used by the modern lowland peoples.

**Summary**

The studies of cultural ecology in tropical rainforests have not arrived at generally accepted conclusions concerning the assumptions of students who have spoken of the limited potential of such areas in terms of settlement pattern, social organization or cultural advancement. Perhaps, just as it would be difficult for loggers to view swidden farmers with sympathy, studies of the tropical rainforests have suffered from a temperate zone ethnocentrism (cf., Bates 1952:271-272).
The cultural ecology approach to lowland Maya prehistory began with attempts to explain the catastrophe of the Maya collapse. The explanations both supported and grew out of the low opinion of tropical jungles common to many early twentieth century scholars. Such uncomfortable and disease ridden places were not considered proper environmental settings for the development or maintenance of civilization. Specific arguments in support of this thesis centered on the agricultural practices characteristic of peoples presently living in rainforests; these practices were viewed as wasteful, backward, and unproductive. The agricultural technology was thought to determine low population densities and preclude concentrations of population in large communities. Such conclusions generated both an increased interest in the settlement patterns of prehistoric peoples in the Maya lowlands and further studies of native agriculture.

Recent data has supported opposition to the contentions listed above. The productivity and efficiency of tropical agriculture is now thought to be higher than most early scholars supposed. The ideal pattern of dispersed settlement as an important part of tropical agricultural technology has seldom been encountered by ethnologists. Moreover, several writers have contended agricultural techniques in the prehistoric Maya lowlands might have been considerably different from those of today. If so, models based on contemporary practices would not apply to the past. Palynological data shows that the present environmental setting was a recent development and not characteristic of the more important periods of lowland Maya cultural development. In spite of these new data, however, the idea of a dispersed settlement
pattern, low population density, and a lack of large communities, based on studies of tropical horticulture, remain important referents to present thinking about Maya settlement patterns and inferences concerning social organization derived from them.
CHAPTER VII

SETTLEMENT AND COMMUNITY PATTERN RESEARCH

IN THE MAYA LOWLANDS

The principal archaeological contribution to the cultural ecology approach to Maya history and society has consisted of community and settlement pattern studies. This type of research proceeds by construction of a community typology based on form, content, and arrangement of architecture; then the distribution of these community types through the environment is examined. It is widely recognized that all humans tend to organize their communities and distribute them through space in such a way as to safely optimize access to culturally determined facets of their social and natural environment (Sanders 1962b:99-100; Doxiadis 1970:393-394). This allows for efficient exploitation of the environment. The kinds of human groups found in a society, the buildings made and used by these groups, the arrangement of such buildings in various kinds of communities, and the geographical pattern formed by such communities are all interrelated phenomena forming an important part of areas of cultural behavior most closely involved with exploitation of the environment (Willey 1956c:1). Therefore studies of these phenomena have figured prominently in debates about the relationships between nature and the Maya populations through time.
Two principal schools of thought have developed in the field of Maya settlement pattern studies. The roots of the "traditional school" may be traced to the scholars who studied and emphasized the Maya "great tradition." While most students of Maya art, science, and writing expended only minimal energy in research on ordinary Maya houses or settlement patterns outside the great architectural centers, they did evolve an interpretation of Maya society as a whole. These scholars believed the Maya constituted a civilization whose highly stratified populations were ruled by kings, nobles, and high priests.

They believed the characteristic Maya community was a city as in other instances of civilizations. Following Morley, Shook and Proskouriakoff (1956:99-100) have been considered leading advocates of this traditional school of thought. Relying heavily on sixteenth century Spanish sources that describe Maya communities at the time of contact, they viewed the principal Maya archaeological sites as concentrations of population large enough to be termed cities or at least towns.

The second school of thought concerning prehistoric Maya community patterns grew from attempts to reconcile Maya archaeological and ethnohistorical research with the results of other anthropological fieldwork, especially ethnological studies of modern Maya social and economic systems. Archaeological settlement patterns themselves were the data for the adherents of this new school. These data, largely interpreted by historical analogy to social systems in the modern Maya highlands and through cross-cultural comparisons and analogy to other tropical peoples with swidden economics and technologies, has enabled scholars like Brainerd (1956), Willey (1956a), Sanders (1962b; 1963),
Bullard (1964), and Vogt (1964a, 1969) to present a picture of somewhat less stratified and more egalitarian people living dispersed through the Maya lowlands in small hamlets. In their view the large Maya sites were not cities, but economic and religious centers without large resident populations.

Contemporary archaeological research on Maya settlement patterns consists largely of four sources: the work of Willey, Bullard, Glass, and Gifford (1965) on the Belize Valley, Bullard's (1960) survey of the Peten, the Carnegie Institution of Washington's project at Mayapan (Pollock, Roys, Proskouriakoff, and Smith 1962), and the recent studies of Haviland (1963, 1965a, 1969) and his associates at Tikal. The background to this contemporary research is found in the writings of three earlier students, Morley, J.E.S. Thompson, and Ricketson. A short summary of their studies will precede a discussion of the more recent publications.

**Sylvanus Morley's View of Maya Settlement Patterns**

The writings of Sylvanus G. Morley contain many of the ideas that became popular after Mesoamericanists rejected the Morgan and Bandelier concept of lowland Maya social organization. Morley (1946: 160-162, 172) wrote of Maya cities, temples, and palaces. He considered the ancient Maya sites analogous to Greek city-states, ruled by a political structure somewhat like that of feudal Europe; Maya society, he thought, had at its upper levels a hereditary nobility and a powerful priesthood. Many of the largest vaulted buildings in the middle of the Maya sites were palaces for the housing of this upper
class. Around them were concentrated the houses of the lower classes; these were thought to be much like the thatched houses of the present Yucatecan farmers. This view of a Maya community is derived mostly from Landa's description (Tozzer 1941).

Morley was one of the first students to systematically differentiate between the larger Maya sites (Morley 1920:440-441, 1946:316-319). He ranked the sites into three categories of importance based on the extent of architectural remains and number of hieroglyphic monuments found at each center. The most important sites, rated Class I, were Tikal and Copan. His Class II and Class III sites were thought to have been of equal importance; these categories included Palenque, Naranjo, Uaxactun, and Yaxchilan. These were followed in importance by a number of smaller cities of Class IV. Though Morley seems to have thought of their functions as more or less the same, he showed that some Maya archaeological sites were smaller and less important than others. If Morley's data are considered a reflection of the energy expended in the construction of the sites he examined, these sites could be ranked from those with a high energy cost to those with a relatively low energy cost. Data in this dissertation, consisting of buildings and groups of buildings at Dzibilchaltun, will be treated in a similar manner.

Thompson's Settlement Pattern Survey in British Honduras

J.E.S. Thompson (1931:232-260) produced the first modern settlement pattern study in the Maya lowlands by contrasting residential sites and the larger "cities," or sites with religious structures,
stelae, and palaces. Within an area of about 12 square kilometers, in British Honduras, Thompson found some 17 "plazuelas" or courts which were leveled quadrilateral areas averaging 25 meters on each side with mounds around them. These were interpreted as homes of the wealthier Maya. The plazuelas were clustered in three groups, each of which Thompson considered a residential site, because ceremonial architecture was lacking in them. The inhabitants of the residential communities, Thompson thought, traveled to the two cities found within the area surveyed for religious gatherings. These cities were about 0.8 to 3.0 kilometers from the residential site. Thus the people from these two kinds of communities all interacted in a single social system.

The Ricketson Study at Uaxactun

Thompson's study, relatively intensive in its scope and cautious in its interpretations, was followed by a frequently cited, extensive study of lowland Maya settlement pattern conducted by O. G. Ricketson (1937:15-24). Ricketson tried to estimate the population of the environs of Uaxactun and the population of the Maya lowlands as a whole by counting the number of house ruins in a sample of the countryside around that center. He divided a cruciform area extending in four directions from Uaxactun into squares, 100 yards on a side. Searching this area, he found 78 house mounds. Each house mound was thought to have been utilized by a family of 5 individuals. A total of 2,720,000 square yards was examined; the uninhabitable swampland and the area covered by the ceremonial center itself were not counted part of this total. The population density computed by Ricketson, even after it was
assumed that only 25 percent of the houses were occupied at the same
time, was 270.83 persons per square mile (104.57 per square kilometer).
This figure, Ricketson noted, was higher than the population density
of New York State. Ricketson's data have been discussed and reinter-
preted many times (Morley 1946:313-315; Brainerd 1954:70-71; Willey
96-99; Willey and Bullard 1965:364-365; Haviland 1966a:26). These same
data, analyzed in different ways, have been used to support arguments
for both very high and very low population densities in the prehistoric
Maya lowlands.

Influenced by ethnological community studies that were being
carried out in various parts of Mesoamerica during the decade of the
thirties, Ricketson explained his data from Uaxactun by analogy to the
communities and settlement patterns of highland Guatemala. Projecting
the features of Solola (McBryde 1933:135), a commercial center that
hosts two annual religious fairs that double the size of its markets,
into the past of the Maya lowlands, Ricketson (1937:15) wrote:

The great ruins to which we refer as cities were never in
my opinion, urban communities in our sense of the word.
They were centers where people from the surrounding
countryside gathered to attend the weekly markets and the
major religious festivals held in the well-paved plazas
then as they are today in Solola and Chichicastenango.
... This theory is born out by two incontrovertible
facts. First, the groups of pyramids, mounds, and temples
around plazas which constitute Old Empire ruins, offer no
housing accommodations for the common people; even the
multi-chambered buildings of northern Yucatan are totally
inadequate for the sparsest population. Second, no limits
can be set (except natural conditions of terrain, such as
swamp) whereby the house-mounds, scattered throughout the
vicinity, can be said to end.... If every house-mound
were occupied simultaneously when the Maya were at their
peak, the population would have been enormous.
With these words, Ricketson repeated the objections advanced by Morgan and Bandelier to the notion of Maya "cities." Subsequent authors largely agree; the statement quoted is almost identical to the views of Termer (1951:105), Brainerd (1954:70), J.E.S. Thompson (1954:54), Vogt (1964b:23-24), Pollock (1965:381), and Willey and Bullard (1965:375-377). Ricketson's work seems to have laid the foundation for the most widely accepted concept of Maya centers today.

**Thompson's Linguistic Evidence**

J.E.S. Thompson's acceptance of the idea that the Classic Maya centers were not cities was the next important step in the development of contemporary ideas about Maya settlement pattern. His study of Maya terms related to larger communities showed that these words were central Mexican in origin. Moreover, he noted a contrast between settlements of the Postclassic Maya and the open earlier sites. Therefore, Thompson (1943a:23) concluded that the town form of settlement pattern was a Toltec introduction to the Maya lowlands.

**Contemporary Studies**

The study of Maya settlement patterns resumed after a hiatus caused by the Second World War, becoming especially productive between 1950 and 1960. Two groups of Mayanists emerged from the discussions that took place at that time; the focus of the differences between them was a basic disagreement about the nature of the Maya city or ceremonial center. Shook and Proskouriakoff considered the ceremonial centers the nuclei of true cities or towns as described by Landa while Brainerd, Thompson, Willey, and Bullard essentially agreed with
Ricketson's view (cf., Willey 1956a:109).

The two opposing views of Maya settlement patterns were the basis for a continuing debate concerning the structure of Classic Maya society in the lowlands, especially the nature of the relationship between the food producers who supported the centers and their political and religious leaders. The problem of the collapse of the Maya centers in the Peten was the context of these debates. While agreeing with those who believed the Maya centers were not true cities, J.E.S. Thompson (1954:84-90) became the leader of the group of scholars who proposed internal strife as the cause of the Classic collapse. He proposed a theory involving infatuation of the Maya aristocracy with exotic ideas from the central Mexican highlands and subsequent revolt by an alienated peasantry.

Borhegyi (1956) marshalled archaeological evidence for such peasant revolts in the Maya highlands, and argued a case for the existence of a folk-urban dichotomy in Classic Maya society. Following the work of Redfield (1941) and others, Borhegyi postulated the presence of interdependent but increasingly different folk and urban components in the Maya social system. The foreign pantheon worshipped in the ceremonial centers by the urban elite forming the complex component of the system became less and less relevant for the farmers supporting the centers. During the Late Classic the farmers revolted.

Willey (1956b) countered Borhegyi's arguments with a summary of data from several years of fieldwork in the Belize Valley of British Honduras. He reported surveys there discovered networks of ceremonial centers and sub-centers distributed among house ruins. Moreover, he
described the finding of rich material remains in house mounds far from the ceremonial centers, including pottery almost identical to luxury wares from the centers and even evidence of hieroglyphic writing. These data, in light of the concept of a dispersed lowland settlement pattern were interpreted as "... a Maya peasant class that was reasonably prosperous and participating in a cultural tradition not markedly apart from the inhabitants of the great religious centers" (Willey (1956b:779). Willey's article presented a case for a more closely integrated and less highly stratified society than the formulations suggested by J.E.S. Thompson, Borhegyi, or Morley.

The final report of the Belize Valley project (Willey, Bullard, Glass, and Gifford 1965) is one of the four principal sources of data concerning Maya community and settlement patterns available to date. It describes the late Classic settlement pattern there as a continuous strip of house mounds along either side of the river with ruins extending about half a kilometer from the banks for about sixty kilometers. Willey believes the strip was divided into four "zones," with major ceremonial centers as administrative headquarters for at least three of them. Minor ceremonial centers, considered theocratic substations, are located among the house ruins about a kilometer apart; ideally each zone should contain about 14 such minor centers. Willey estimates a population of 6,000 persons per zone and 24,000 for the entire valley. These people are thought to have farmed the entire watershed of the Belize River, a strip of land about 10 kilometers wide and 60 kilometers long with the river running through its center. The population density of the valley would have been 40 persons per square kilometer,
a figure that approximated Ursula Cowgill's (1962) estimate of the lowest agricultural carrying capacity, which was 38 people per square kilometer. According to Willey and his associates, then, the ideal major ceremonial center in the Belize Valley would have been sustained by 14 or 15 social groups of about 400 people each. The sustaining area of the major centers would have been about 150 square kilometers.

The productive decade of research on Maya settlement patterns came to a close with the publication of William R. Bullard's (1960) extensive survey of the Peten, a second major source of settlement pattern data. This short article seems to have been the culmination of thinking that took place during the preceding ten years; more than any other research, it has helped to structure almost every subsequent attempt to analyze Maya life and society. Three kinds of ruins were found by Bullard in the Peten: house mounds, minor ceremonial centers, and major ceremonial centers. Bullard found that "clusters" of from five to twelve houses formed aggregates containing from 50 to 100 houses, each such aggregate with a minor ceremonial center as its nucleus. Several such aggregates or "zones" were grouped around a major ceremonial center. This organization, clusters of houses arranged in zones around a minor ceremonial center and a number of zones about a major center, was a detailed account of what Willey (1956b:778) meant by his "... large but well-integrated network of theocratic stations and substations. . . ."

Bullard was reluctant to assign terms with socio-political significance as names for the kinds of communities or settlements he defined, but Vogt (1964b:23-28) supplied a popular interpretation
through analogy to the modern inhabitants of the Chiapas highlands. Bullard's clusters were said by Vogt to be the residences of "patrilocal extended families" and his zones were the housing for "patrilineal clans." The leadership centered in the major centers, Vogt believed, may have at least partially been recruited on a rotating basis from the surrounding sustaining area just as ceremonial offices are filled in the Chiapas highlands today. Bullard (1964) seemed to agree with this interpretation; his survey tends to support Willey's conception of a highly integrated and more democratic Maya society.

Intensive research at Tikal, the third source for community and settlement pattern data, did not at all support the conclusions of Bullard's survey. Morley (1946:316-319) considered this site one of the two largest and most important centers in the entire lowlands; if any Maya site was truly urban, Tikal should have been. But a map of sixteen square kilometers at the center of Tikal (Carr and Hazard 1961) was first interpreted as evidence that the site was not the remains of a community with a population large enough to be called urban (Willey 1962; Sanders 1963:207-208). Haviland (1963:521, 1966a:32), however, after considerable field research on the small structures plotted on the map, estimated the resident population of those sixteen square kilometers at between 10,000 and 11,000 persons during the late Classic. This would have equaled a density of over 600 persons per square kilometer. Recent fieldwork at Tikal has shown that the site extended over a far larger area; its boundaries, marked by a dropoff in the density of ruins and an encircling defensive earthwork, are now thought to enclose about 163 square kilometers. By projecting his
figures for the sixteen square kilometers mapped at the center of the site, Haviland (1969:430) assessed the late Classic population of the site at 49,000 persons. The work of Haviland and his associates then seems to demonstrate that Tikal was a community of urban proportions and a significant exception to the concept of empty ceremonial centers.

Mayapan, the other site in the Maya lowlands where intensive community pattern research was carried out, and the fourth major source of such data, has also been considered urban. Indeed, this late Postclassic site, known through ethnohistorical sources to have been ruled by persons claiming central Mexican ancestry, has long been contrasted with earlier Classic centers in the lowlands in order to illustrate the differences between what was thought to be the indigenous dispersed settlement pattern and the compact settlement type believed to have been a late introduction to the area from the central highlands (cf., Brainerd 1954:86, 1956:163-164; Sanders 1963:224-230; Willey and Bullard 1965:370). Mayapan contains about 4,000 structures within or near the walls that surround it. The walls themselves enclose an area of 4.2 square kilometers (Jones 1952; Smith 1962). Most of the buildings have been interpreted as dwellings and associated structures; Smith (1962:171) considered only 122 of the 4,000 structures to have been civic or religious buildings. Some 2,100 of the buildings were interpreted as dwellings; most of the remaining structures were thought to have been auxiliary constructions associated with the dwellings. Using an average of 5.6 persons per Maya family, Smith (1962:211) estimated the population of the site at between 11,000 and 12,000 persons.
Mayapan has been regarded as a complete community of urban proportions rather than a non-residential ceremonial center. Advocates of the dispersed view of Maya settlement pattern have emphasized the differences between urban Mayapan and the earlier non-urban communities. Ethnohistorical sources (cf., Roys 1962), however, indicate that Mayapan was the model of an administrative and religious center supported by a vast sustaining area. Some students, particularly Haviland (1966:43, 1969:431) have found it useful to consider the similarities Mayapan shares with earlier sites, noting that perhaps the function and social organization of Mayapan was much more like that of the Classic centers than most scholars have supposed.

Summary

The problems involving settlement patterns in the Maya lowlands have not been settled by the studies summarized in this section. The ideal models of settlement pattern utilized by two groups of Mayanists persist as bases for conflicting interpretations of Maya society. The trend in settlement pattern research, however, seems to be in the direction of more community pattern surveys rather than the settlement pattern research similar to that carried out by Bullard in the Peten. In general, the more intensive community surveys have resulted in data supporting the view of larger and denser Maya communities and populations. Moreover, extensive surveys of settlement patterns in the lowlands produced a traditional concept of Classic Maya housing that is somewhat different than the picture gleamed from intensive surveys. Settlement pattern research, like the community studies, is ultimately
based on examination of housing distribution; its results can be biased by inadequate knowledge about the range in dwelling forms. Thus the contrasting descriptions of housing serve as a test of reliability for the conclusions of the extensive surveys.
CHAPTER VIII

STUDIES OF MAYA HOUSES

The settlement pattern studies in the Maya lowlands must be put into perspective with a discussion of the smallest unit examined by the surveyors—a house. Ricketson's (1937:15-24) survey was a count of "house-mounds". Earlier J. E. S. Thompson (1931:233-237) dealt with similar "plazuelas" and these seem to have been much like the "houses," "house ruins," and "house mounds" examined by Willey (1965:572) and Bullard (1960:358; Willey and Bullard 1965:360-363). Students of Maya settlement patterns in the field have, until recently, shared similar views about what constitutes an ancient Maya house. In general this view has been that the ordinary Maya houses were quite large and elaborate.

Wauchope's Description of House Mounds

Robert Wauchope (1934, 1938, 1940) was one of the few students to examine Maya houses closely. Referring specifically to the house mounds of Uaxactun, Wauchope (1934:132) defined what was being counted by Ricketson:

Perhaps a word should be added here in explanation of just what is meant when we refer to the "house mounds" at Uaxactun. The term has been used in speaking of any of the low, inconspicuous mounds (4 to 10 feet, 1.22 to 3.05 meters, high) which are scattered, singly and in clusters.
of two to four and five, on inhabitable (non-bajo) land in the vicinity of the major groups of ruins. It is by no means certain that all of them were actually used as substructures for perishable houses, for many may have been burial mounds and some may have served other purposes. Only excavation can reveal their individual functions.

In cutting a way through heavy bush, one can easily pass across low house mounds without being aware of their presence. They vary in length from about 20 to 70 feet (6.1 to 21.34 meters) and from about 15 to 30 feet (4.57 to 9.14 meters) in breadth; they are usually much longer than wide.

Wauchope's use of the term "house mound" was quite consistent with earlier studies; J. E. S. Thompson's (1931:234) illustrations and Thomas Gann's (1918) descriptions are all summarized by Wauchope's words. Moreover, it is clear that the later work in the Peten and Belize was characterized by much the same idea about what constitutes a Maya house.

Willey and Bullard's View of Maya Housing

Willey and Bullard are leaders of the dispersed settlement pattern school of Mayanists. Numerous descriptions and illustrations in their works (Bullard 1960:358; Willey and Bullard 1965:362; Willey 1966:122-123) show that their ideal lowland Maya house ruin is a substructure about 20 meters on a side and over a meter high. Two types of house remains were reported from sites in the Belize Valley: "ordinary house mounds" and "plazuela mounds", the later described as more elaborate versions of the ordinary mounds (Willey 1965:572). Bullard (1965:34) described the mounds of the ordinary category:
The first category includes the great majority of the mounds (fig. 7, bottom). They are dome-shaped tumuli with oval or circular ground plans, measuring between about 15 and 35 m. in diameter and .30 and 3.50 m. in height. The average size falls near the middle of these ranges. Our excavations have shown that they contain earth-filled rectangular platforms with plaster floors and stone-masonry retaining walls, and that they were substructures for houses of perishable construction. Many underwent numerous rebuildings and modifications during the long occupation of the site.

The average ordinary house mound then, is about 2 meters high; the "typical Barton Ramie small ruin mound" in Bullard's illustration appears to be about that size.

The larger plazuela mounds are exemplified by structures 40 to 60 meters across and 2.50 to 5.00 meters high (Bullard 1965:34). Willey (1965:572) interprets the plazuelas as housing for people of a different social status; the plazuelas at Barton Ramie, he notes, were mostly late Classic developments.

**Bullard's Contrast Between Prehistoric and Modern Maya Houses**

This view of Maya housing is further evidenced in a proposed contrast between impressive Maya homes of the past and poor quality housing built today. Bullard (1964:285) wrote in 1962:

Moreover, one is impressed by the house ruins themselves. In contrast with the rather shoddy masonry work found today in wall footings and other occasional masonry features of modern Maya houses, the Classic house platforms were well-built and arranged, with hard plaster floors and well-laid and cemented stone retaining walls. Not only were the skills necessary for such building common among the populace, but the traditions of high quality workmanship and pride in impressive appearance were deeply ingrained through all levels of the society.
Bullard's contrast is valid only if his description of ancient Maya housing is accurate. Certainly the farmers in Yucatan do not build platforms a meter high as substructures for their dwellings today! Nor do the Maya of the Chiapas highlands, but Bullard interprets this contrast as added evidence for "... a more equalitarian society with considerable social mobility" (Bullard 1964:284). This supposition about Classic Maya society as a whole is perhaps intentionally tempered by use of contradictory terms—"equalitarian" and "social mobility."

Several objections can be raised about Bullard's conclusions concerning Maya housing. Edward H. Thompson (1882:266-269), Wauchope (1934:116-123), and Smith (1962:176-177) all analyzed representations of houses in Maya art; they concluded that small, thatched houses, like those used by the Maya today, were the common dwellings of the past. Wauchope (1934:123-124), though he too, like Bullard, hinted of a deterioration in the quality of the common Maya house through time, believed the common bush house used in Yucatan today has been utilized in the Maya area for close to 2,000 years. Bullard himself contrasted the Maya houses of the past with those of today. Therefore if small thatched houses without the large substructures he described were frequently built in the past, the kind of contrast he reported between the houses of the past and those of today would have existed in antiquity. The implications of such a contrast—that some people lived in expensive houses while others lived in cheap ones—would not support Bullard's conclusions about a lack of stratification and an equalitarian social organization.
Most modern Maya houses built in the lowlands today are not erected on large platforms, so they disappear without a visible trace within a few years of abandonment. Andrews (1965:37) has consistently argued that most Maya houses in the past were not placed on platforms. Such perishable houses would not have been found by modern surveyors, thus settlement pattern studies have been greatly biased. Willey and Bullard (1965:363; cf. Bullard 1960:359), however, do not seem to believe that there were a large number of such "invisible" ruins. They maintain that most ancient Maya houses were built on relatively large platforms which can easily be found while Andrews believes that the common house of the Classic Stage Maya was considerably smaller and less impressive.

Another problem related to Bullard's contrast is the question of vaulted buildings functioning as dwellings. Most vaulted buildings are thought to have been used for ceremonial activities, though some students like Morgan and Morley considered them habitations. Morley termed them palaces, believing them to have been used as homes by the ruling classes. J. E. S. Thompson (1954:57-58) objected to this idea, at least in the case of the larger vaulted buildings. These he thought were too dark and damp for habitation, though he strongly hinted in an earlier publication that some vaulted buildings may have been residences (J. E. S. Thompson 1940). Bullard (1964:284-285) admits the possibility that vaulted buildings could have been used as houses. Wauchope (1934:60) did not decide whether or not the vaulted buildings he found near simpler structures in his house mound study were houses or lesser temples. Haviland (1963), Folan (1969:}
Harrison (1969:172) and I (Kurjack 1964:45-49), however, have all presented evidence for the use of such buildings as dwellings. Vaulted buildings would have been considerably harder to construct than even the larger thatched buildings on sizeable platforms. If they were used as houses for some of the people while others lived in small thatched structures, the housing of the ancient Maya would have been characterized by variability and contrast rather than uniformity. Conclusions opposite the ones reached by Bullard would thus appear reasonable.

Indeed, Haviland’s (1963) detailed study of housing at Tikal arrived at conclusions quite different from those of Bullard. His data constituted a wide variety of small and large platforms with evidence of simple superstructures as well as multi-roomed palace type construction. Haviland (1963:512-513, 517) interpreted his evidence as indications of great status differences between individuals; but these differences seemed to have been part of a social continuum rather than sharp differences between classes and castes. Maya society, Haviland argued, must have been more complex than is suggested by a two part class system of nobles and commoners; he believed that considerable economic specialization must have been present.

**Houses at Postclassic Mayapan**

The housing situation at Postclassic Mayapan in the northern lowlands is somewhat different from descriptions of houses at Classic sites to the south. While several authors have contrasted the degree of urbanism represented at these two kinds of sites, few
have compared the large structures thought to be common housing in the Peten and Belize with the somewhat smaller dwellings surveyed and excavated at Mayapan. Bullard reports that ordinary housemounds in Belize are between 0.30 and 3.50 meters high with the average at about 2 meters. The range at Mayapan is between 0.15 and 0.80 meters (Smith 1962:225). This difference could be explained in several ways: Excavation shows that the Belize mounds were added to constantly through time and ethnohistorical data indicate the occupation of Mayapan was short lived; perhaps the mounds there never were occupied long enough to grow as large as those in the south. The relative intensity of the surveys may also have been a factor; every rise at Mayapan seems to have some sort of small mound at its summit. Perhaps the expectation that contour lines would enclose a house led to the discovery of mounds only 15 centimeters high. Such mounds may have been missed in most of the surveys in the southern lowlands. The point remains that Mayapan, known to have been the residence of numerous high status families and the administrative center for much of north Yucatan, contains dwellings far less splendid than those reported in the Peten and Belize. Interpretations of the studies of Classic centers in the southern lowlands leave the impression that most of the buildings in the ceremonial centers and a large number of mounds outside the centers were political or religious in their function. Only about 3.5 percent of the total structures and 1.52 percent of the area were utilized as housing for political or religious functions at Mayapan; the remainder of the architecture at the site was domestic (Smith 1962:71).
Smith (1962:217, Figure 8) ranks the buildings thought to be dwellings at Mayapan from simple to elaborate. About 50 of the 2,000 dwellings were large and impressive enough to have been considered the homes of the wealthy or important; most of these were at the center of the site near the area believed to have been the religious and administrative center. The other dwellings, some 97 or 98 percent of the total were lower class housing, the homes of the poor or unimportant. The housing at Mayapan, according to Smith, follows Landa's account of Maya society, class structure and architecture quite closely lending credence to the reliability of the work in other areas of culture.

**Summary**

The traditional view of prehistoric Maya housing indicates most Maya dwellings were large and elaborate. The contemporary students who accept this view do not seem to be concerned with architectural detail (cf., Willey and Bullard 1965:363). Intensive surveys carried out by people who were interested in such detail have, by contrast, produced data indicating a wide range in form and energy cost of building types. These data lead me to question the traditional concept of Maya housing and the interpretations of Maya life and society based on this concept. My own data from Dzibilchaltun can only be interpreted as support for the position that most prehistoric Maya housed themselves in simple and inexpensive dwellings. I find contrasts in the energy cost of house types at Dzibilchaltun; I believe this contrast must have been related to important aspects of the prehistoric Maya social system.
CHAPTER IX

BACKGROUND AND DEVELOPMENT OF THE
DZIBILCHALTUN SURVEY

The purpose of this section of my dissertation is to describe and discuss community pattern data from Dzibilchaltun. The data are presented on a map that has been distributed by the Middle American Research Institute (Stuart, et al. 1965). Methods used in gathering these data will be explained in this chapter, then the architectural remains themselves will be described. Next the distribution of the ruins in time and space will be inspected. Finally the implications of the Dzibilchaltun study for the problems listed in the preceding chapters will be treated.

The archaeological zone of Dzibilchaltun lies in the flat coastal plain of north Yucatan, some twelve miles inland from the Gulf of Mexico (see Figure 1). The readily visible features found there, including large, unexcavated mounds of collapsed masonry, excavated ruins, the central cenote, and over three kilometers of raised causeways, or sacbeob, spread over the core of the zone, indicate the site had once been a community of importance. The first serious investigations in the area uncovered the remains of an exceptionally long prehistoric occupation lasting from Formative to post-conquest times. The extent of the site and its occupation are the principal reasons the Middle American Research Institute expended ten years of study.
there. The products of these years of research are described in preliminary form by the publications of E. Wyllys Andrews IV, project director (Andrews 1959, 1960, 1961, 1962, 1965a, 1965b, 1968).

The Institute's project at Dzibilchaltun included an extensive and detailed program of mapping and test-pitting, the results of which are used as data in this dissertation. This program was carried out by George E. Stuart, John W. Cottier, John C. Sheffler, and myself, under the direction of E. Wyllys Andrews IV. The end product of our efforts includes a map of approximately nineteen square kilometers surrounding the center of the site. The map shows the location and general groundplan of some 8,500 individual pre-Columbian structures, over 700 of which were sufficiently examined for temporal placement. A prepublication edition of this map has already been released by the Middle American Research Institute; discussions of the implications of the map have appeared in various publications (Pollock 1965:381-385; Willey and Bullard 19-5:370-372; Sanders and Price 1968:160; Andrews 1968:47).

The necessity for an intensive survey of Dzibilchaltun became more apparent when early investigation of the size of the site yielded data conflicting with some of the most striking observations of other settlement pattern studies in the Maya area. Most recent research has tended to substantiate the view that the Maya sites were not cities in the sense of compact communities with large resident populations. But Andrews (1959:91-95, 109), after a preliminary reconnaissance of Dzibilchaltun, reported densely packed ruins covered twenty square miles. Was Dzibilchaltun a non-residential ceremonial center or did it once house a population of truly urban proportions?
The survey of the zone was launched to test Andrews' impressions of the site's dimensions, to determine the variety of ruins there and to examine their distribution.

**Description of the Surveyed Area**

Surveying activities and excavations were concentrated in three areas of the archaeological zone. The bulk of the investigations took place near the three principal causeways or *sacbeob* that intersect near Cenote Xlacah at the center of the site. The map of Dzibilchaltun covers this part of the site and its environs including all of the area a kilometer and a half north and the same distance south of the causeways. The map extends east 2.7 and west 4.1 kilometers from the cenote. The west boundary is the Merida-Progresso Highway. The test-pitting operations connected with the present study covered the area of the map. Excavations also took place in two areas west of the Merida-Progresso Highway. Twenty ruins were investigated by David Bowles in a small area three kilometers west of Xcanatun, which is located on the Merida-Progresso just south of the main section of the map. The second area west of the highway was about a kilometer northwest of the northwest corner of the map. The locations of these areas are shown on the aerial photograph in Figure 2.

**History of the Survey**

Data and ideas accumulated during ten years of fieldwork at Dzibilchaltun are reflected in the map and in this report. The following paragraphs barely sketch the more important steps in the

Two maps were made of Dzibilchaltun prior to the present project. The first map, published by Brainerd (1958:344), was the result of fieldwork during 1941. It shows only the central ruins and sacbeob or raised causeways. The second chart, produced by Willard Sloshberg in 1956, the first year of fieldwork on the present project, covered a much larger area around the causeways and surrounding bush. This map was a sketch made with a Brunton compass; Sloshberg illustrated very little architectural detail. His work tended to substantiate Andrews' assessment of the site however, and created more interest in attempting a detailed mapping project.

Detailed mapping was started by George Stuart in 1958. Stuart was not only a trained surveyor but also a talented artist; examination of the published reports will indicate the variety of artistic tasks he undertook during his two periods of work at Dzibilchaltun. While Stuart worked out the basic surveying techniques and commenced mapping, he was able to complete only the outline of the major causeways and plot the groundplan of some ruins at the center of the site. The survey was interrupted by his departure.

Work resumed in October of 1962 when John C. Scheffler, John W. Cottier, and I arrived to continue the survey. Fieldwork for the map released by the Middle American Research Institute in 1964 was completed by us by September of 1963. I returned to Yucatan in December of 1963 and stayed until September of 1964 working on
descriptions of architecture and comparisons of modern houses. I returned again in the summer of 1965 to examine house ruins west of the highway that divides the site.

For the purpose of making clear my relation to the data used in this dissertation, I would like to acknowledge once more my heavy reliance on fieldwork and notes by Scheffler and Cottier. Cottier did all of the test-pitting and excavations mentioned in this dissertation; the spatial analysis of his results is my own work. Scheffler, whose training was in architecture, did most of the more elaborate drafting, as well as surveying the southern portion of the map. I surveyed the northern part of the map and completed the architectural descriptions used here. The spatial analysis of the data published on the map is my own work. Scheffler and Cottier are of course, in no way responsible for the way I have used their data; indeed they may choose to disagree with my conclusions. Over ten years of fieldwork by others at Dzibilchaltun layed the groundwork for the survey. In order to make the map we used fieldnotes and groundplans completed by almost everyone who has ever worked at the site. My fieldwork would have been impossible had I not been able to build on the foundation produced by my predecessors on the staff of the Middle American Research Institute's Dzibilchaltun Program and its Director, E. Wyllys Andrews IV.

**Objectives and Methods**

The main purpose of the survey was a test of Dzibilchaltun's size in terms of concentrations of ruined structures. In order to do this, our primary objective was to complete an intensive survey of a
large area in a deliberate effort to find all of the ruins. The second objective was exploration of a considerable sample of ruins in order to give chronological dimension to the study. A third objective was to gather as much architectural data as possible; this goal enjoyed much lower priority and was generally sacrificed in favor of the first two.

The nature of the vegetation at Dzibilchaltun made the first objective, finding and mapping all of the ruins, impossible. The heavy cover of trees, bushes, and vines obscured many small platforms and perhaps even some of the larger ruins. Most of the land in the vicinity is either blanketed with low, thorny scrub forest or bush characteristic of northern Yucatan, or is utilized for the cultivation of henequen; the density of vegetation varies considerably in either case. The thickness of the bush can be seen in the background of photographs illustrating ruin types, especially Figure 10. This kind of vegetation changes from season to season; during dry periods, walking off trails is relatively easy. At other times the tangled bush is difficult to traverse and very hard to search. Henequen fields range from those cleared and burned off prior to planting to those abandoned to formidable secondary growth. Many of the fields were examined while the rows between the plants were heavily overgrown. Because of these factors, the techniques used to survey the area and map the ruins varied from place to place. The accuracy of the coverage varied with the techniques used, the type of vegetation in an area, and the season.
In general, henequen fields seem to have been more adequately covered than areas covered with bush. Figure 2, the aerial photograph of the site taken in December of 1969, shows which parts of the site were in henequen and thus had the best coverage.

One indication of the reliability of the map with respect to finding all of the ruins is the fact that the surveyors were constantly missing ruins that Cottier had excavated. Moreover, several areas mapped while they were in bush were later burned off by local farmers; almost always a number of unmapped ruins would become visible. Clearly, our survey was not as complete as we had hoped it would be; our first goal was nowhere near accomplished.

The second objective of the survey, chronological placement of individual ruins, was accomplished in three ways. The most frequently used method was test-pitting. Test excavations about a meter square were undertaken in some 700 structures located over the entire mapped area. Where features of special interest were encountered, the excavations were enlarged to expose them. A sample of artifacts taken from these excavations was usually sufficient to date the ruin. The second method involved dating by architectural style; in this report this method is referred to as "architectural exploration." The construction periods of the 240 vaulted buildings on the map were identified by examination of the kinds of masonry techniques utilized in their construction. This method could be used to determine chronological placement even if the structure was not excavated. Finally, ceramic samples were taken from the surface of many other ruins. Surface collecting was especially easy where sherds had been
freshly exposed by the commercial quarrying operations which continue in their steady destruction of the site.

The third objective of the survey was to gather architectural data. The entire groundplan of each ruin was secured if this could be done economically. Large platforms were quickly recognized, since at least parts of their retaining walls usually survive and remain exposed longer than most other masonry. Both the rubble used to fill the interior of a platform and the small gravel used to pave its surface can be readily distinguished from heaps of stone formed by collapse of superstructure masonry.

Unvaulted buildings, whether raised on platforms or constructed on the ground surface, were identified by the amount and nature of the debris present. The debris was sufficient only to build walls or wall foundations, but not for masonry covering or roofing. Usually the basal course of masonry was exposed on the surface. Often however, the basal course of masonry walls, unprotected by covering dirt or debris, had been partly obliterated, either destroyed by nature or carried away by humans. Depending on the amount of such destruction, determination of the groundplan was either quite easy or impossible.

Vaulted buildings were identified by the large amount of masonry debris and the presence of specially shaped limestone blocks used in their construction. Buildings with masonry vaults require a great deal of material, and when the vaults collapse, their contents become a mound about half as high as the original building. The specially shaped stones, like vault capstones and large pieces of moulding blocks, litter the surface of the mounds that were once
vaulted buildings. The debris from vaulted buildings erected during
the earlier Classic phases at Dzibilchaltun contrasts with the veneer
blocks found in the debris of later vaulted construction.

Groundplans of vaulted structures were determined by inference
from exposed walls, corners, and doorways. Limited excavation was
often carried out for the purpose of locating other architectural
features. Often the surveyor completed his plan by estimating the
location of a corner or doorway rather than actually uncovering it.
This procedure was possible because much formal Maya architecture was
symmetrical in groundplan. The symbols used on the plan of any building
shown on the map will indicate how much of the structure was actually
exposed and how much of the groundplan was estimated.

Mapping Procedures

The mapping of the site was begun by establishing a grid
system with a transit. Twenty-five hectare squares were carefully
marked out; auxiliary lines were then cut through most of the wooded
sections at 100 meter intervals. In these areas the ruins were detected
by workers who were sent, ten or twenty meters apart, through the
bush along either side of these lines. The henequen fields were easier
to map, for they are planted in 20 by 20 meter plots providing a ready-
made grid system. Search of the henequen fields was accomplished by
workers who walked among the rows of plants ten or twenty meters
apart, their distance depending on the density of the vegetation and
the number of ruins encountered. The locating and orientations of
the ruins in relation to the established grid system or the henequen
field grids were measured with tape and a Brunton compass.
As structures were encountered they were assigned a number and described. As the number of buildings in these notes reached 1,000, the numbering system became very cumbersome. For this reason, a grid system was devised in order to serve as a method for designating individual structures. The southwest corner of each square kilometer of the map of Dzibilchaltun is labeled with a capital letter indicating distance north and a lower case letter indicating distance east of a grid origin. Any point on the map and any structure at such a point can be designated by its relationship to the southwest corner of its square kilometer map unit. For example, a position 430 meters north and 785 meters east of the southwest corner of the sheet with the coordinates \( J \) and \( o \) is written \( J_{430}o_{785} \). This is the location of Cenote Xlacah at the center of the site. Structure 1, the Temple of the Seven Dolls at Dzibilchaltun (Andrews 1959), is now designated \( J_{515}p_{580} \).

Previous Fieldwork at Dzibilchaltun

Brainerd (1958) and Andrews' excavations in the "Palace" near Cenote Xlacah in 1941 constituted the earliest serious fieldwork at Dzibilchaltun. Andrews (1959, 1960) began the Middle American Research Institute's project at the site in 1956. The most earliest excavations were centered at the Temple of the Seven Dolls and associated structures and the Standing Temple. These structures provided documentation for a long sequence at the site, for both of them were erected during the late Classic and re-occupied during the Decadent Period. The excavation of two "Black-on-Cream" structures near the "Palace" (Andrews 1961) and studies of the Spanish chapel
(Folan 1970) provided even more evidence of late pre-contact and sixteenth century activity at the site. Then in the areas of the zone west of the Merida-Progresso highway, excavation of two groups of structures—the Mirador Complex and the Structure 450 Group—provided evidence of a long pre-Classic occupation. Synthesis of this material is reported by Andrews (1965a) in the 

_Handbook of Middle American Indians._ This synthesis forms the basis for the chronological chart in Table 1.
CHAPTER X

TEMPORAL DISTRIBUTION OF THE RUINS AT DZIBILCHALTUN

Since Brainerd's (1958) 1941 fieldwork at Dzibilchaltun, it was known that the structures there were made and used during an exceptionally long period of occupation. For this reason, the first reactions to the large concentrations of ruins at the site were to consider them either an accumulation from slow building throughout the entire span of the site's occupation or the remains of an extensive Decadent community like Mayapan. In spite of the fact that the earliest excavations at the site did not produce much Decadent pottery, the later hypothesis was especially attractive, for in 1593 a Spanish church had been erected on Dzibilchaltun's central plaza (Brainerd 1958:15-16; Folan 1969:459), attesting to the presence of an early post-contact settlement at the site. To resolve such questions, over 750 structures were explored by excavation, test-pitting, surface collection, or architectural survey in order to ascertain their periods of occupation.

Data gathered in this manner clearly show that most of the structures at the site, close to 90 percent of the ruins excavated, were built or occupied during Early Period Phase I or the Pure Florescent Phase. This observation may be directly interpreted in terms of the history of population and settlement pattern at the site.
Sampling Problems

In order to determine the temporal distribution of the ruins at Dzibilchaltun on a massive scale, it was decided to collect large amounts of data in the fastest and most economical manner possible. While every effort was made to include all of the areas on the map and all of the types of construction, this emphasis on large quantities of data, rather than carefully selected data, may have introduced certain biases that must be taken into account in any evaluation of this study. Many ruins were tested, excavated, or otherwise examined because they were of special interest or because this examination could be accomplished conveniently. Recent thefts of stone from the site, for example, had exposed profiles from which sherds could easily be collected for dating purposes. Utilization of this data, of course, requires special care. The number of vaulted buildings examined for temporal placement far exceeds their relative frequency at Dzibilchaltun. Of the 240 vaulted buildings at the site, 113 were either test-pitted, excavated, or surface collected (see Table 6). Indeed, larger structures seem to have been consistently tested more often than smaller ones. The largest structures test-pitted during our survey however, would be considered small at most other projects in the lowlands. Nevertheless, our investigations to determine temporal distribution of the ruins were neither evenly spread over the mapped area nor randomly focused among the structures encountered in the mapping process.

The excavation program at Dzibilchaltun did include the testing of every kind of architectural feature imaginable. The entire
known range of structures was investigated. Both modern house ruins and colonial house ruins were examined. Small piles of gravel were tested; indeed, few unnatural circles of rocks, large or small, escaped the scrutiny of the digging crews. Even slabs of rocks said to have been used as chicken coops and the remains of recent huts found in old swidden fields were carefully excavated so that we could be sure that no architectural type was missed.

While the excavations may not have been evenly distributed over the map of Dzibilchaltun, every part of the area covered was in some measure examined by the excavators. The maps showing the locations of the test pits also mark the location of every prominent group of ruins on the map. The reader may assume that a few structures from all of the larger groups of buildings shown on the map are included in the sample.

The reliability of small samples taken from a test pit in a structure may also be called to question. Some large platforms tested yielded no pottery or other artifacts. In many cases the sample from a structure consisted of only 5 or 10 sherds. Sampling error under these conditions may be quite high.

On the other hand, complete excavation of any structure usually turned up some sherds from all of the periods in the site's history. While each structure examined contained cultural debris pertaining mostly to one or perhaps two phases, the larger the scope of the excavations at any structure, the more likely it was that some material from other phases would be collected. This implies that any
test-pitted structure would probably yield evidence of other "occupations" had the excavations been extended.

One goal of our operations at Dzibilchaltun was to gather architectural detail. Groundplans for individual structures were secured if at all possible; in drawing the map at least an approximation of the groundplans was necessary. Determining the groundplans of any vaulted structure at the site involved gathering data about its date of construction. In this manner, the list of dated construction was swelled with over two hundred structures that could date from only two of the periods in the site's history.

Three possible sources of error then, must be taken into account in the evaluation of data presented in this thesis. First, no formal effort was made to sample the areas or structures on the map of the site randomly. Second, the small sized samples of cultural material taken from many structures may not have been reliable indicators of their date of occupation or construction. Third, the data from the various procedures used to date a structure: complete excavation, test-pitting, surface sampling, and architectural surveying, may not be comparable for certain statistical operations. The effect of these sources of error are possibly mitigated by the fact that all of the areas on the map and all of the known ruin types were examined in quantity.

Methods of Dating Structures

Structures were dated in two ways. Both the ceramic types and the kinds of vaulted buildings made and used during various periods of the site's occupation had been worked out by Andrews and his
associates prior to the start of the survey. Usually any sample of pottery taken from the surface of a building or a small test excavation could be assigned to one of the phases in the history of the site. Masonry debris from vaulted buildings erected during the Florescent Phase was very different from the debris of a collapsed Early Period vaulted structure; thus, most of the large mounds dating from either of these phases could be dated at a glance. Either the pottery or the architecture found in a structure could be utilized to date it.

In most cases the evidence for dating a structure consisted of a small sample of sherds from a test pit in the building. If a ceramic type known to represent a phase was present in the sample, then use or occupation of the structure during that phase may be inferred. The pottery may include types from more than one phase, most probably indicating successive occupations. Each time any pottery from a phase was found in a ceramic sample, it was concluded that the structure or perhaps an earlier structure on the same spot had been used during that phase.

Temporal Distribution of 715 Structures on the Map of Dzibilchaltun

The bulk of the test-pitted, surface-collected, or excavated structures at Dzibilchaltun are situated within the area bound by the map of the site. Investigations were carried out at a total of 715 structures in that area: 426 structures were test-pitted, 32 structures were the objects of intensive investigation, pottery was
taken from the surface of 130 others, and 127 additional vaulted buildings were the site of architectural investigations. These studies showed that 90% or more of the structures at the site were built or occupied during the Pure Florescent Phase or Early Period Phase II, the period of time during which Copo pottery was being manufactured.

The results of the investigations in all 715 structures are illustrated in Figures 3-8. The charts shown in those figures contain dots representing the location of each of the 715 investigated structures. All of the dots representing structures where evidence of construction or occupation during the phase illustrated by a given chart will be shaded solid black. The dots or circles left unshaded represent investigated structures where no evidence of construction or occupation during the phase illustrated by the chart was found.

The size of the population at the site during the various phases in its history may be estimated from the relative number of shaded dots per phase. Examination of the charts clearly indicates a large population during the Formative, a very large population during the Early Period II and Pure Florescent Phases, and a relatively low population during other phases.

Interpretation of the charts in the manner suggested by the preceding paragraph may be misleading for the reasons mentioned in the section concerning sampling problems. The 475 unvaulted structures investigated for temporal placement are similar to several thousand other structures within the mapped area that were not investigated. The 240 vaulted buildings however are not similar to any other known
buildings. Since most of the people at the site lived in unvaulted structures like the 475 we examined, it would be better to consider the relative proportions of unvaulted structures utilized during each of the phases in the Dzibilchaltun sequence as a measure of relative population size through time. Moreover, it may be sounder to consider test-pitted structures separately from surface-sampled structures to reduce any bias that may have been introduced through selective collecting of unusual or particularly noticeable sherds.

Table 2 documents the number of test-pitted unvaulted structures found to contain pottery from the various phases in the chronology of the site. Structures that were surface sampled and all vaulted structures were excluded from the sample. The statistics in Table 2 include no information from the structures at the site that were completely excavated.

Table 2 summarizes the results of excavations in 392 unvaulted structures. Some of these structures contain pottery from more than one phase, thus the total of the percentages is over 100 percent. The percentages were computed by dividing the number of structures containing pottery from a given phase by the number of structures tested.

The data summarized in Table 2 indicates Dzibilchaltun was very heavily occupied during the late Classic phases at the site. Of the 392 structures examined, 355 or about 92 percent contained the Copo pottery characteristic of these phases. Formative pottery, mostly of the Middle Formative Chacah ceramic phase, was found at 103 structures, about 23 percent of those investigated. All of the
other phases in the sequence at the site were represented in 4 percent or less of the 392 structures.

Summary

Prehistorians have traditionally used changes in the amount of material culture through time to make estimates of the changes in the demographic history of a site or region (cf. Gabel 1967:34-35). I feel that the data in Table 2 can be translated into such a relative estimate for Dzibilchaltun. The estimate will be presented in the conclusions to this dissertation.

The excavations carried out at Dzibilchaltun by Cottier and other archaeologists, as summarized in Table 2 and Figures 3-8, indicate the mapped area of Dzibilchaltun contained many small Formative settlements. The relative frequency of collections containing Formative pottery, as shown by Figure 3, seems to be larger on the west side of the map. The biggest concentrations of structures dating from this stage are probably situated around the excavated Formative mounds situated west of the highway that divides the site (Andrews 1968). These areas are not on the map of the site, but their location is indicated on the aerial photograph of the site (Figure 2).

Perhaps subsequent building within the mapped area of the site obliterated much of the Formative construction there. Formative pottery was encountered in some quantity at excavations in the central group of ruins near Cenote Xlacah, though little evidence of Formative building was found. Brainerd (1958) believes the central group must have been the site of a great deal of Formative construction activity.
If this is true, we have no way of knowing how large or how concentrated this activity would have been.

Early Period Phase I pottery was encountered very infrequently within the mapped area. The number of structures marked by the Zipche pottery characteristic of this phase contrasts with both the large number of structures where Formative pottery was encountered and the very large number of structures where the subsequent Copo wares were found. No vaulted architecture representing this phase has been encountered; indeed, only two structures over the entire site are known to have been built at all. This evidence suggests the population of Dzibilchaltun was very low during Early Period Phase I, a time of important activity in other parts of the Maya lowlands.

Nine-tenths or more of all test-pitted structures contained the late Classic Copo pottery. Most of the cultural activity that resulted in the creation of the site as it now stands therefore, probably took place during the Early Period Phase II and the Pure Florescent Phase. Certainly the largest architectural features at Dzibilchaltun, the raised causeways and the enormous vaulted buildings at the center of the site, were constructed during these phases. The bulk of the settlement and community pattern data from the site then, is related to these two late Classic phases; further analysis of community and settlement pattern during the late Classic can therefore be attempted in the following chapters.

Most of the Modified Florescent through Decadent pottery was found near the central group where the larger structures at the site are concentrated. Very few structures were found to contain Modified
Florescent (Zipche) pottery; but perhaps this situation is in part an artifact of the difficulty of distinguishing Modified Florescent (Zipche) pottery from the earlier Pure Florescent and Early Period Phase II (Copo) pottery. This would be especially difficult in the small samples of sherds from the structures investigated by Cottier. Black-on-Cream (Haas) ware, however, is very easy to distinguish; but only a few structures were found to contain this kind of pottery either. This would indicate that the assessment of the size of the Modified Florescent component at the site is reasonable; at least there is no great fluctuation in the relative amount of material between the two phases.

Of particular interest is the number of structures built or occupied during the Decadent phases. Excavations at the center of the site demonstrates that there was a great deal of activity during these phases at Dzibilchaltun. Andrews (1960:256-257; 1965a:327). Stelae and shrines were erected at the site and many vaulted structures were re-occupied. The Temple of the Seven Dolls (Andrews 1959) was modified for use as some type of ceremonial building. The population of the site was large enough even after the population decline of the sixteenth century to justify the construction of a Spanish church on the principal plaza of the site between 1590 and 1600 (Folan 1970).

The introductory chapters in this dissertation report that there is considerable debate about the size of Yucatan's population at the time of conquest. Some scholars believe the population size was large while others believe it was relatively small. Many scholars
have used their estimates of the population during the sixteenth century in order to infer the size of the populations during the Classic Stage. It is of interest, therefore, to compare the amount of cultural material at Dzibilchaltun from the late Classic with the cultural material from the Decadent Period.

Only 16 of the 392 test-pitted structures contained Decadent (Chechem) pottery. Unless our procedure led to a great deal of sampling error, this would indicate that whether the population of Yucatan during the sixteenth century was small as reported by Roys (1965; 661) or large as estimated by Lange (1971), the relative size of population of Dzibilchaltun during the late Classic Stage was far larger than the population of the site during the Decadent period. It would be dangerous to apply the results from Dzibilchaltun to the entire state, but the contrast in the amount of material remains from these two periods at least suggests that the late Classic population of the state was far larger than that of the sixteenth century. The contrast takes on added significance when it is remembered that Dzibilchaltun was an important site during the Decadent.

This chapter has described the evidence for the conclusion that most of the archaeological remains at Dzibilchaltun date from the late Classic Stage. The remaining chapters present an analysis of the buildings at Dzibilchaltun in order to gain added insight into the structure of Maya society during that period in the site's history.
CHAPTER XI

PRE-COLUMBIAN ARCHITECTURAL TYPES AT DZIBILCHALTUN

Most of the buildings constructed by Dzibilchaltun's pre-historic inhabitants are in an advanced state of ruin. Nothing, of course, remains of non-masonry construction. The bulk of the substructures support no evidence of any superstructure masonry. The superstructures that once crowned these pyramids and platforms must have been made entirely of perishable materials, probably much like the thatched wattle-and-daub homes used in the area today. Such buildings have entirely disappeared. Most of the unvaulted structures at Dzibilchaltun are now so badly ruined that only their approximate groundplans and dimensions could be recorded; usually parts of the basal course of masonry are all that is intact. The retaining walls of platforms and pyramids are at least partially collapsed. Indeed, the most common structures found at the site are small, badly ruined platforms around which no masonry retaining walls remain. Only heaps of rubble fill containing a few small sherds mark these places; all other vestiges of the buildings that had once existed at these locations are gone. Even the vaulted buildings had mostly collapsed. Of 240 such buildings at Dzibilchaltun, only the Standing Temple (Andrews 1959) had retained part of its masonry roof.
Some of the ruins at Dzibilchaltun, however, are far better preserved than one would expect. Careful examination of these few well-preserved ruins aids in the interpretation of the less complete structures. Surviving evidence of this sort seems to include the entire range of prehistoric structure types made of masonry. Particularly interesting is the exquisite preservation of some smaller buildings at the site. Judging from the published reports of work at other sites in the Maya lowlands, the smaller buildings at Dzibilchaltun are better preserved than the similar structures that must have existed at other sites. Certainly a search of the literature reveals few descriptions of structures comparable to those presented in the following pages. Perhaps the lack of large trees at Dzibilchaltun is the crucial factor in the preservation of the smaller ruins there; the trees in the Peten rainforest would surely destroy any of the small apsidal ruins that abound at Dzibilchaltun. The examples of the better preserved masonry types described below seem to represent a far greater range in structures in both size and form than has been reported from any other lowland site. Inadequate knowledge of this area of lowland Maya material culture, I believe, has biased social interpretation of the lowland Maya remains. The data on the small buildings described in the following pages should lead to modification of some of these interpretations.

**Survey of the Number and Variety of Ruins**

Most of the structures encountered at Dzibilchaltun consisted of small and large platforms without evidence of superstructures. The remains of buildings that once had roofs of thatch were the next
most frequently found type of ruin. Such ruins, termed unvaulted in order to distinguish them from the formal, all-masonry vaulted buildings, were situated both on platforms and on the ground surface. Usually no more than a basal course of masonry surrounded by rubble from the walls of the structure remained at these locations. Formal vaulted buildings, well-known to anyone familiar with the literature on Maya ruins, constitute the third category of ruins. There were 240 of these vaulted structures; they are subdivided into four types described elsewhere in this chapter.

This dissertation is concerned most with the kinds of platforms and unvaulted buildings at Dzibilchaltun, for many authors have described vaulted architecture from Dzibilchaltun and elsewhere. The platforms vary in their height, width, and length; these dimensions range from high pyramidal substructures presumably used as foundations for ceremonial architecture to low piles of gravel that must have been used as the bases for single-roomed buildings of perishable material. The unvaulted buildings had three basic kinds of groundplans: single-roomed apsidal structures, single-roomed rectangular structures, and multi-roomed rectangular structures. Separate sections of this chapter describe the buildings in each of these categories.

Table 3 reports the number of unvaulted structures in each of the categories mentioned above. Table 4 reports the number of test-pitted unvaulted structures containing pottery from a given phase by structure type. Table 5 reports the number of structures in each category for which the phase of construction has been determined. All of the structures on the list in Table 5 were test-pitted and found to contain pottery from only one phase in the site's history, or in a
few cases, an overwhelming amount of pottery from one phase and a stray sherd or two from another phase. Tables 4 and 5 show that each type of unvaulted structure found at Dzibilchaltun was made and used during the late Classic phases. Exclusive reliance on the principle of abundance was criticized by Haviland (1966a:32), but in spite of his critique the argument is still strong. I consider the large numbers of structures of each of our types at the site good evidence for their use as housing. Additional arguments for the use of specific architectural types as houses will be summarized in the conclusions of this dissertation. Noted below, however, are two general observations from the survey that have bearing on the problem.

Metates were found by surveyors in or near numerous structures of all types in spite of the dense bush that made it hard enough to find the buildings. This was true of all parts of the site. Especially well-documented is the presence of metates and manos in or near vaulted buildings (cf. Folan 1969). In front of the vaulted structure located at J785p969, for example, are 17 well-worn metates. These metates are too large and heavy to have been frequently transported from place to place; it is most probable that the metates are now located where they were last and most often used. Moreover, the metates from all parts of the site showed signs of wear that could have come only from very extensive use. This indicates that occasional ritual preparation of food by religious specialists is probably not an explanation for the presence of these metates near vaulted buildings at the center of the site. The presence of metates near a structure, then, may be considered evidence of a domestic function.

Two late Classic (Copo phase) pottery types are particularly frequent in the small samples taken from test-pits in buildings at
Dzibilchaltun. These are Medium Slateware Bolster Rim Basins and Unslipped Striated Utility Jars. Domestic use of both of these types has been suggested by Brainerd (1958:84, 79-81). It is notable that these types are found in platforms, small and large thatched structures, and vaulted buildings as well. This may be considered added evidence that most of these buildings probably served as houses.

Representative Terraces, Platforms, and Pyramids

Most masonry construction at Dzibilchaltun was elevated on large and small substructure terraces, platforms, or pyramids. These substructures had many probable functions. The first of these was very practical: to lift the building above the surface sufficiently to provide good drainage. Judging by the situation today, the average annual rainfall was not overly great when Dzibilchaltun thrived, but it came mostly during the four or five summer months and it often came in torrents. A house built directly on a low, flat area would have had a flooded floor dozens of afternoons each rainy season. In the dry Puuc area, some 90 kilometers south of Dzibilchaltun, large amounts of water drained off platforms were collected in cisterns (chultunes) under the substructures. At Dzibilchaltun, where subsurface water was readily available, this was not done. Many platforms are higher than good drainage alone would have required. Moreover, many houses in the area today exist with minimal provisions for drainage; constructed on the ground surface, they are located in such a way that no special substructure is needed for added drainage.
Thus the ancient Maya probably had other reasons for building elaborate substructures.

The well-drained surfaces of the substructures probably served as outdoor living and working areas. Metates found on the surfaces of platforms but outside the remains of superstructure masonry constructions indicate that some food preparation took place there. The platform surfaces seem to have been integral parts of those buildings used as houses. Levi-Strauss (1967) and Rapport (1969:66-69, 79-82) discuss the cognitive significance of boundaries formed in human building activities. The retaining walls of a platform or terrace of a house probably marked the edge of what Rapport (1969:80) calls "semi-public domain". In light of the cross-cultural regularities examined by these authors, the surface of platforms must have been contrasted with the surrounding land in the minds of the people who utilized them.

Platforms were level foundations for buildings. In northern Yucatan at least, bedrock is often too close to the surface for the sinking of posts for wooden buildings. But the main timbers of a house or other structure could easily be buried in the fill of platforms. The dry fill would even keep the timbers from rotting much longer than if they were placed in the ground.

The terraces, platforms, and pyramids probably served a more elusive function as well. Buildings represent a readily visible form of wealth. Validation of status through public display of wealth seems to have been a widespread pattern in North America, especially on the Northwest Coast, Mesoamerica, and adjacent culture areas (Driver 1961:385-404; Wolf 1959:141-142). Because much more energy
was expended on the construction of substructures for buildings than needed for the functions described above, it is probable that the size and quality of such construction reflected upon the status of the social group utilizing and controlling it.

Due to the rocky and uneven ground surface in northern Yucatan, leveling an area and raising it as a base for new construction was difficult. The early Maya, however, learned a relatively simple way to ease the task and reduce the labor. As locations for platforms, they utilized the numerous bedrock outcrops that stood slightly above the rest of the surface. The area around these outcrops was built up with rubble which was retained in place by masonry walls. The foundations were surfaced with gravel and often finished with plaster.

While most of the platforms had opposite sides of equal length, adjacent sides did not always intersect at right angles. This kind of roughly rectangular ground plan was common for the smaller platforms but many bigger ones were asymmetrically enlarged.

Platforms ranged from 3 meters wide and not much longer, to 20 meters or more on each side. In height, the majority measured less than 0.5 meters, though a few reached 1.5 meters.

Two methods of constructing retaining walls were most frequently used. Usually a low wall consisted of a single row of horizontally laid and crudely finished blocks. Some of these blocks were quite large (e.g., 2.5 meters long, a meter wide, and 0.5 meters high). Walls higher than this were constructed of two or more courses of masonry varying from poorly coursed unworked slabs to selected or
slightly dressed blocks. A third method occurred occasionally in which the walls are a single course of upright slabs.

Often platforms were built in more than one level. The construction of a foundation for a house slightly raised above the surface of the supporting larger platform was noted many times. It was common for lower terraces to be built adjacent to platforms. Buried retaining walls, the old edges of enlarged platforms, were seen in many instances.

A number of platforms were test-pitted by Cottier. The sherd yield from these excavations was extremely varied. A one-meter square test-hole in a platform with well-defined retaining walls would sometimes produce fewer sherds than a similar pit in the least obvious mound of rubble. Other excavations turned up a great many sherds. What this means is not clear. Pottery was taken from 168 platforms: 44 of these were less than 10 by 10 meters in area but still less than a meter high, 87 were larger in area but still less than a meter high, and 37 were both large and between one and two meters high. Most of the platforms contained only Copo pottery dating from either the Early Period Phase II or the Pure Florescent. Formative pottery was encountered next most frequently.

Table 5 indicates the number of platforms considered "dated construction." Test excavations in these structures yielded either only pottery from a single phase or an overwhelming amount of pottery from a single phase plus a few stray sherds thought to be unassociated with the excavated structure.
A few of the better preserved platforms are described below:

**Structure 761. J660p825.** This is a small well-defined platform, 300 meters northeast of the Temple of the Seven Dolls. Several vaulted and unvaulted buildings are found in the general area. The platform averages 0.5 meters high, 6 meters long, and 4.7 meters wide. Retaining walls consist of two courses of large unworked stone slabs, the largest of which is one meter long, 0.9 meters wide, and 0.28 meters high. The long axis of the platform is oriented N 62° E.

Cottier placed a test-pit near the center of the platform and excavated to bedrock. Forty-eight sherds, over half of them slateware fragments, were found during this operation. All of the material dated from the Early Period II or Pure Florescent phases.

**Structure 700. J507p951.** This is a platform 370 meters due east of the Temple of the Seven Dolls. It is 23 meters long and 9.5 meters wide, with the long axis oriented S 75° E. The retaining walls are slightly over a meter high. They are constructed of crude, unworked slabs. Near the southeast corner, the walls consist of three courses of large, crudely coursed slabs, with spalling used between the courses. A small set of steps with three rises is centered along the north wall.

The structure was test-pitted by Cottier near its northwest corner. Bedrock was encountered 1.49 meters below the surface of the platform. A total of 68 sherds, all Copo types were taken from the excavation.
Structure 715. J494p826. This large platform is 250 meters due east of the Temple of the Seven Dolls. Structure 715 is on the east side of a plaza complex containing it and two similar platforms.

The platform is 15.5 meters long and 9 meters wide. The retaining walls near the northeast corner measure only 0.44 meters high, but near the opposite southwest corner the walls reach 1.04 meters. The retaining walls at their greatest height are built of two courses of very large slabs, some of which measure 1.45 meters long, 1 meter thick, and 0.55 meters high. Two courses of smaller size slabs are used near the northeast corner. Little or no evidence of dressing is found on any of the slabs. The coursing of the slabs is fairly even, in spite of their uneven sizes.

The first test-pit placed in the structure yielded no sherds, and the second excavation unit contained only 5 slateware fragments. Bedrock was encountered 0.9 meters below the surface of the platform. The plaster floor of an earlier building was found at a depth of 0.6 meters.

Representative Single-Roomed Apsidal Structures

The typical house found in areas where Yucatec Maya is spoken today is a picturesque single-roomed thatched building. The most distinctive feature of these structures is their apsidal or round-ended groundplan. The walls are made of masonry, wattle-and-daub, wood, or a combination of these materials. In villages and towns, the houses are situated on the street; in order to enter the property of their owners, one must pass through the house. A second doorway at the back of the house leads to the "back yard" and the
secondary structures found there. Many of these houses in the forests away from gridded communities, however, have only one doorway at the front of the structures. Outdoor domestic activity in such case is oriented towards the front of the house. Wauchope (1940:236) studied the distribution of these houses; he considered their distribution closely correlated with the spread of Maya speaking populations in Yucatan and Campeche.

Wauchope (1934:123-124) and others have believed that this kind of structure was very old in the Maya lowlands, though there has never been a great deal of direct data supporting this conclusion. Only rarely have round ended structures been reported in an early context. Moreover, the careful surveying at the late prehistoric site of Mayapan did not disclose examples of this type of construction. For these reasons, the possibility remained that the modern Yucatecan apsidal dwellings were a late introduction.

The remains of large numbers of apsidal structures were found in all areas of the map of Dzibilchaltun. These usually consisted of a single or double row of upright slabs that formed the basal course of masonry. In many cases all or some of the slabs had fallen over. In other instances they were broken up by the action of the elements leaving only their lower portions protruding a few centimeters above the surface.

The amount of debris present at the site of these apsidal remains shows that most possessed only a basal course of masonry. The remainder of the walls above the basal course must have consisted of perishable materials. The relatively thin upright slabs making
up the basal course probably served as a foundation for vertical
daub-covered poles. Modern houses are made in this manner. The
debris present at a few the ruined apsidal structures did indicate
all masonry walls; modern houses are often constructed in this way
as well.

The ruined apsidal buildings were found both on platforms
and situated directly on the ground surface.

Most of the apsidal structures found at Dzibilchaltun meas­
ured 5 to 7 meters in length and 2.5 to 4.5 meters in width. A
larger variant of the apsidal structure type was sometimes encoun­
tered; these buildings were 9-12 meters long and correspondingly
wider. In a few cases two doors were present at the front of the
structures. Very infrequently an interior partition divided the
structure into two rooms.

Dating the apsidal structures at the site soon became a
primary concern of our survey, especially at the start of the pro­
gram. Within a very short time, the test-pitting program demon­
strated the long temporal depth of the apsidal housing tradition
in Yucatan. Round ended structures at the site have yielded asso­
ciations that definitely place them in Formative, late Classic, and
Decadent contexts.

Eight Formative apsidal structures were investigated by
Cottier in the mapped area east of the Merida-Progresso highway.
Others were found west of the highway; there they seemed to have been
closer to circular than apsidal in groundplan. A total of 137
apsidal structures, including four that might have contained more
than one room, were found to contain predominantly Copo pottery when test-pitted. One of these structures, described below, even had a tomb with associated Copo wares. Two apsidal structures, found just west of Cenote Xlacah at the center of the site near the Capilla Abierta contained Decadent or Colonial pottery. These structures were also well-defined, their wall footings in two instances having been made with re-used Pure Florescent veneer blocks. The structures had not yet been modified to include the rear door so characteristic of apsidal dwellings in Maya villages today. Clearly, our data show that the building of apsidal houses is a northern Yucatecan tradition that spans the entire length of the prehistoric record found there.

The following paragraphs describe four typical well-preserved apsidal structures that were surveyed, mapped and described by me and test-pitted by John Cottier in 1962-1963:

Structure 3721. K737m645. (See Figures 9 and 10). This presumed house is situated on a small well-defined low platform. A number of other low platforms are located in the immediate vicinity, but this building is the largest and the only one with a remaining superstructure. It stands on the east side of a poorly laid out plaza that is also bordered by two low platforms one on the north and one on the south. No traces of retaining walls remain around these platforms. Scattered gravel is found over the central parts of the plaza suggesting that it was once paved.
The structure itself measures 5.5 meters long by 3.65 meters wide on the exterior. Much of the basal course of masonry is intact, consisting of a single row of low upright slabs that vary in shape, height, and thickness. Only the jamb stones had received any shaping. These were roughly dressed to a comparatively straight and smooth surface on their jamb sides. The two jamb stones remain in place, although one had fallen over and the other was broken off. They are the highest slabs used at the basal course, measuring 0.8 meters high, 0.35 meters wide, 0.45 meters long, and 0.6 meters high, 0.28 meters wide, and 0.6 meters long. The approximate width of the doorway is 0.8 meters.

Many of the other slabs in the first course had broken off. The masonry walls had probably extended only a short distance above the basal course, judging from the amount of rubble present. The rest of the wall and the roof must have been of perishable materials.

The platform on which the structure rests measures 8.8 meters long by 7.5 meters wide. The retaining wall at the front or west side of the platform averages 0.2 meters high, 0.5 to 1 meter long, and 0.4 to 0.7 meters wide. The slabs forming the retaining wall had been broken so as to have a roughly straight, but by no means smooth, face along their length. The retaining walls on the north and south sides are similar, but at the back or east of the structure the wall is irregular or non-existent due to the outcropping of the bedrock that forms the core of the platform. In one place near the northeast corner of the platform, the bedrock is cut to resemble the retaining wall.
This structure was test-pitted by Cottier near its center, and a tomb was uncovered 0.18 meters below the surface. It measures 0.25 by 1.15 meters. An outcropping of bedrock serves as one side of the tomb and small slabs set upright form the other sides. A Medium Slate basal break tripod plate and a Fine Grey rattle bowl were found within the tomb. The other pottery from the test-pit and the finding of this tomb clearly dates the structure, placing it in a late Classic Stage context; all of the other pottery found within the structure is also of late Early Period or Pure Florescent (Copó) provenience.

Structure 3605. 1615q003. (See Figure 11). This presumed dwelling has a single door facing west. It is situated on a well-defined low platform located 1 kilometer south and 400 meters east of the Temple of the Seven Dolls. The area around the structure is particularly dense with small ruins. It is almost in the middle of a square kilometer that contains some 733 ruins, only 1/3 of which are vaulted.

The house itself is 6.3 meters long by 4.3 meters wide on the exterior, and 5.35 meters long by 3.45 meters wide in the interior. Only two courses of wall masonry are intact around most of the structure. On the north side of the structure 1.2 meters of wall remain standing. These walls consist of crude rectanguloid blocks with no surface treatment. The blocks are horizontally laid with fairly even coursing in spite of the varying shapes and sizes of the stones. The blocks range from 0.13 to 0.25 meters high, 0.46 to 0.85 meters long, and 0.32 to 0.5 meters thick. Smaller spalling was used between the
larger irregular blocks. The walls probably were all masonry, but the amount of rubble precludes these walls having been very much higher than the highest standing section.

The doorjambs are upright slabs which appear to have been smoothed on the jamb face. This smoothing is most apparent on the buried unweathered surfaces. Both of the basal jamb stones remain in place. The one on the south side measures 0.6 meters high, 0.59 meters wide, and 0.25 meters long (along the length of the wall) while the other stands approximately 0.6 meters high, 0.25 meters long, and 0.56 meters wide.

The platform is 9 meters long and 6.3 meters wide, with the long side oriented 9° east of grid north. It is built of two or more courses attaining a height of 0.65 meters on the west side. The slabs used in this wall are unfinished. They include some that measure 1.25 meters long, 0.9 meters thick, and 0.31 meters high. Due to the slope of the land, the other walls are lower than the west wall. A single step is present at the middle of the front wall.

A one-meter-square test-pit was dug by Cottier in the center of the house and excavated to bedrock. The work produced only three late Early Period or Pure Florescent (Copo) sherds.

**Structure 3610.  I695p890.** (See Figure 12). This building has a single door facing north. The structure was constructed on a very low platform in an area densely covered by aboriginal ruins.

The building measures 4 meters wide by 6.1 meters long on the exterior and 3.15 meters wide and 5.4 meters long in the interior. Most of the basal course, a single row of upright slabs, is intact.
Several particularly large slabs are on the east side; the largest of these is 1.2 meters long, 1.04 meters high, and 0.74 meters thick. Smaller slabs averaging 0.5 meters long, 0.44 meters wide, and 0.31 meters high, were used on the west side. Judging by the amount of debris present, wall masonry could not have been much more than the highest standing slabs of the basal course. The upper parts of the walls were probably of perishable materials.

The jambs consist of two very large, high slabs, both of which are standing. The east jamb stone is 0.95 meters high, 0.56 meters long, and 0.39 meters thick, while the west one is 1.05 meters high, 0.71 meters long, and 0.34 meters thick.

The structure was built on a very low platform (or terrace) that could only have been a few centimeters high. The gravel surfacing of a small, very low substructure appears to be present, but no traces of a retaining wall could be found. The leveled and surfaced area was very small.

Cottier's test excavations in the center of this very well-preserved dwelling produced only five sherds, all late Early Period or Pure Florescent (Copo) wares.

**Structure 736.** (See Figure 13). J597p876. This building is located 300 meters east and 80 meters north of the Temple of the Seven Dolls. There is a small vaulted building only a few meters to the east.

The structure measures 6.5 meters long and 3.6 meters wide. Only the basal course of masonry remained intact when the structure was mapped and test-pitted in the fall of 1962. A year later, most of the walls were torn down and re-used in a nearby stone wall. Fortunately, a stone-by-stone drawing had been made. The basal
course consists of crude slabs set upright and a few smaller blocks laid horizontally. The largest slab, 0.95 meters high, was used on the north doorjamb, and the other jamb stone was only slightly smaller. Jamb faces were fairly straight but not smoothed. The masonry walls probably did not extend much higher than the jambs, for very little debris was found.

Structure 736 was built directly on the surface of the ground without any platform. The interior was floored with gravel, but no evidence of plaster could be detected. A test-pit in the center of the building yielded 188 sherds, including one black glossware fragment, one Fine Grey sherd, and 156 pieces of Unslipped Striated Utility Ware.

Representative Single-Roomed Rectangular Unvaulted Buildings

Many small single-roomed rectangular unvaulted structures, equivalent in size to apsidal houses, were mapped at Dzibilchaltun. Very few of them remain well-preserved; only two examples of this class are described. Omitted from the class are several small single-roomed rectangular structures on the summits of pyramidal mounds, 1.5 to 2 meters high. Usually they were exceptionally well-constructed. They probably served as oratories or for some other religious primary function.

Ceramic samples from test-pits were taken by Cottier from 55 of the structures similar to those I described below. Forty of these yielded only Copo (late Early Period or early Pure Florescent pottery); and some sherds representing these same phases mixed with
other ceramics turned up in all but four of the remaining houses. Fifty-four of the structures rested on low platforms; the one remaining structure was situated directly on the ground surface.

Structure 777. J785p939. (See Figure 14). This structure is located 450 meters northeast of the Temple of the Seven Dolls. It is situated in the southeast corner of a large low platform that is 14.7 meters wide and 23 meters long, with its axis oriented 19° east of grid north. Another single-roomed rectangular unvaulted building occupied the west side of the platform. A metate was found near the center of the substructure.

The building itself is 5.5 meters long and 3.5 meters wide. It was not well-preserved. The remains include most of the basal course of masonry, consisting of a single or double row of low upright slabs. The double row of slabs was used on the north side where the individual slabs ranged from 0.4 to 0.8 meters high. The other walls were of a single row of smaller slabs. The only door seems to have been near the southwest corner, along the short wall.

A meter square test-pit placed in the center of the structure by Cottier was enlarged when three caches were encountered 0.3 meters below the surface. Several short thin slabs formed the sides of the caches with single slabs utilized as covers. One of the caches was located under the north wall of the structure and, hence, probably predated it. All of the pottery found in the caches and test-pit date from the Early Period II or Pure Florescent phases.
Structure 730. (See Figure 15). This is one of the larger single-roomed rectangular buildings. It is on a small low platform, 300 meters northeast of the Temple of the Seven Dolls near many other vaulted and unvaulted structures. A large platform with a long vaulted superstructure is situated a few meters to the east.

Structure 730 measures 8.45 meters long by 3.6 meters wide. Only the basal course of the masonry remains intact, and most of this consists of either a double row of small unworked slabs set upright or a double row of horizontally laid blocks. The total thickness of the walls is 0.65 meters. The amount of debris present suggests that the wall masonry was less than a meter high. Wattle-and-daub or similar construction was probably used above the masonry foundation.

The single doorway is at the center of the west side. The jambs were built of two thicknesses of blocks. The thin well-smoothed blocks were set upright. The largest jamb stone is 0.65 meters high, 0.46 meters long, and 0.16 meters thick.

The platform measures 14.8 meters long by 3.6 meters wide. The retaining walls are a single course of large and small unworked slabs. In one place, a metate was re-used in the wall. On the north side, the platform reaches a maximum height of 0.28 meters. The floor in the interior of the superstructure is 0.15 meters above the level of the platform surface.

A test-pit in the center of the building by Cottier yielded 92 sherds, all of which dated from the Early Period II or Pure Florescent phases.
Multi-Roomed Rectangular Unvaulted Structures

A wide variety of multi-roomed rectangular unvaulted structures, differing in size, shape, and method of construction, exist at Dzibilchaltun. They include a few with walls of masonry approximating careful Florescent workmanship, some with walls of crude masonry, and many with walls of perishable material built on low stone foundations. All rectangular unvaulted buildings larger than 10 meters long and all multi-room buildings are counted in this category.

The basic design of these structures is a single long room, divided by partitions made after the exterior walls had been completed. Rooms were entered by an outside door; going from room to room could have been done only by going outside. No connecting doors were observed.

No evidence of beam-and-mortar roofs was noted at the site. All of the unvaulted structures, therefore, must have been covered with pole-and-thatch roofs similar to those used in the area today.

Large rectangular unvaulted structures have been reported from various sites. Wauchope (1934:159) illustrates one at Uaxactun that must have been like many at Dzibilchaltun. Similar ruins have been investigated at several sites in the Maya lowlands, including Uxmal, Kabah, Sayil, Chichen Itza, and Tikal (Ruppert and Smith 1959; Haviland 1963).

Thirty-four structures in this class were test-pitted by Cottier; all but one contained Copo pottery. Thirty-two of these were considered dated construction from the late Early Period or
Pure Florescent phases (See Table 5). Six may have been erected on re-used Formative platforms. All but one of the tested buildings are situated on platforms. Most of these platforms were low; only five of them were over a meter high.

Just two of the structures in this class are described below. They illustrate the wide range present in the category.

Structure 722. (See Figure 16). This is a carefully constructed two-roomed building, situated on a large low platform. It is located close to the central group of ruins at the site, only 177 meters northwest of the Temple of the Seven Dolls. A lower terrace is adjacent to the platform on the east or front side. A small apsidal building is on the east side of this terrace, facing Structure 722.

The walls of the structure are of true masonry construction. They consist of rectanguloid or trianguloid blocks that vary considerably in size. The walls are two blocks thick, with the interior side of the blocks set into a mortar core. The exterior face of the blocks in the back wall were only partially dressed, but the finish on those in the front wall is equal to the dressing of well-smoothed Florescent stones. The blocks were horizontally laid with irregular coursing. Several upright slabs were part of the basal course of the back wall.

The center portion of the front wall is also two blocks thick. The outer side was constructed of large well-shaped and neatly dressed rectangular blocks. They are uneven in size; coursing,
therefore, is irregular. Smaller blocks were used higher in the wall. The jambs were very well finished; either laid horizontally and thus spanning the entire thickness of the wall with a single block, or vertically requiring two blocks for the same thickness. The interior side of the wall was made of small wall blocks, identical in all respects to those used in Florescent concrete-veneer masonry. In this case, however, they were used in a true masonry wall. These veneer stones and the Copo pottery taken from Cottier's test-pitting at the structure associate it with the Pure Florescent phase.

The structure is 15.1 meters long and 3.5 meters wide, with three doorways symmetrically located in the front wall. It is divided into two uneven rooms by a crude partition that was a later addition to the building. The amount of debris present suggests that the walls of the structure were entirely of masonry. No evidence of a beam-and-mortar roof was found; therefore, the structure was probably covered with thatch.

The platform of Structure 722 is 19 meters long, 14 meters wide, and 0.5 meters high. The retaining walls consist of a single course of large blocks, the exterior faces of which were only roughly dressed. The building itself is situated on the west side of the platform, facing east. The lower terrace on the east side of the platform is 0.25 meters high with dimensions slightly larger than those of the platform proper.

**Structure 20. J436p417.** This building is on the east side of a small group of ruins 20 meters south of the axial sacbe, 170 meters west of the Temple of the Seven Dolls. In
this group are two small late Early Period vaulted buildings. A small ceremonial platform is almost adjacent to Structure 20 on the south side.

The structure measures 12.7 meters long by 3.8 meters wide. Only the basal course of masonry remains, consisting of a single or double row of horizontally laid or upright slabs that vary in size. The long axis of the structure is oriented due north and south. There is a single door in the center of the west side. The jamb stones and some of the blocks in the walls may have been slightly dressed, but most were unworked. Very little debris is found; the walls were probably constructed of wattle-and-daub or some similar material on the low masonry foundation. No platform was present, but the floor of the building was raised a few centimeters above the ground level by a gravel fill.

Structure 20 was not test-pitted, but slateware sherds were present on the surface. Other structures in the group were excavated; they also yielded late Early Period or early Florescent ceramics.

Vaulted Structures

Two-hundred forty vaulted buildings are found at Dzibilchaltun in the mapped area east of the Merida-Progresso Highway. These buildings contain over 540 rooms. The amount of architecture represented by the vaulted buildings is better reflected by the estimated total length of the vaults utilized in their construction. If the vaulted rooms were placed end to end they would form a row at least 4,642 meters long. The amount of architecture in a vaulted
building or group of vaulted buildings, measured in the manner described in this paragraph, is termed "vault length" in this dissertation.

The visitor at Dzibilchaltun may observe only three of vaulted structures that remain largely intact. The other 237 of them are, unless excavated, only piles of debris about two or three meters high. These mounds form when vaults collapse. A surveyor carefully examining such a mound would find walls, doorways, and corners sticking out of the debris. Careful scrutiny may reveal pottery fragments on the surface. A test-pit placed in the middle of the mound encounters the material utilized in the construction of the vault covering a plaster floor. If the excavation is enlarged, an entire room would be cleared of the debris. Below the plaster floor, tombs and caches are usually encountered.

All of the vaulted structures at Dzibilchaltun were investigated with as much care as time would allow. All of the structures were examined to determine the style of architecture, and if possible, the groundplan. Such investigation, of course, enabled the surveyors to date all of the vaulted architecture at the site. Four temporal categories were encountered: vaulted buildings were constructed at the site during Early Period Phase II, the Pure Florescent Phase, a period transitional between these two phases, and a period transitional between the Modified Florescent and the Decadent Period (i.e., the Black-on-Cream Transition). Pottery samples were obtained by Cottier and others from 113 of the 240 vaulted structures, either by
complete excavation, test-pitting, or surface sampling. The kinds of investigations that resulted in the data on vaulted architecture reported here is summarized in Table 6.

Two main styles of vaulted all-masonry construction are found at Dzibilchaltun; the Early Period style built with true masonry walls and corbelled slab vaults and the Pure Florescent style built with concrete veneer walls and vaults. The features of these styles of construction are described below.

The Early Period style true masonry walls are built in such manner that the weight-bearing surfaces of the limestone blocks forming the wall carry the weight of the blocks above them. If a block is removed from the wall, the blocks above will soon fall. This contrasts with the walls of Pure Florescent buildings with concrete veneer walls. Pure Florescent walls consist of cores of concrete faced with limestone blocks. The weight of the walls themselves and the vaults above the walls are supported by the concrete cores. Often buildings are found where the limestone veneer had fallen from the wall's core, but the buildings remain standing.

The blocks used in the walls of these two styles of vaulted buildings are quite distinctive; Pure Florescent veneer blocks are neatly dressed and squared while Early Period wall blocks are only roughly shaped and left with their exterior faces unsmoothed unless they served the purpose of jambs, cornerstones, or molding blocks. These specially purposed blocks are often neatly shaped and their surfaces smoothed.
The vaults of Early Period and Pure Florescent buildings also contrast in both their appearance and method of construction. Early Period buildings are roofed over with true corbelled vaults, meaning that thin slabs of limestone are placed on other limestone slabs with the edges of the upper slabs extending beyond the edge of the lower slabs to cover the span between the walls of a building. This technique is illustrated by Andrews (1960:261; 1965). The Pure Florescent vault described and illustrated by Andrews is very different. Pure Florescent vaults are made with "boot-shaped" stones or blocks with tenons that stick deeply into the concrete mixed with rubble cores of the vaults. Again the boot-shaped vault stones form a veneer that covers the weight-bearing core of the vault. Both ideally and in practice, the largely unshaped slabs of limestone that compose the Early Period vault and the neatly dressed boot-shaped stones facing the Pure Florescent vaults can easily be distinguished, even if they are found on the surface of a collapsed building.

Embellishment of Early Period vaulted buildings was accomplished by means of covering the walls with a thick coat of stucco. This stucco was then carved. The best surviving examples of Early Period masonry decorated with such carved stucco facades is found at Palenque; in north Yucatan good examples of this technique are found at Acanceh and on the Temple of the Seven Dolls at Dzibilchaltun (Andrews 1965). Pure Florescent facades, however, are decorated by carving blocks of limestone into intricate shapes and arranging them in a mosaic design that covers the exterior of the building.
Most Pure Florescent vaulted buildings at Dzibilchaltun were in an advanced state of ruin, so the facade decoration could not be observed. Many of the carved blocks from these mosaics were found on the surface, however. The best intact examples of this kind of facade decoration are found at Uxmal.

The number of Early Period vaulted buildings plotted on the map of Dzibilchaltun is 150. Their location, size, and substructure type are recorded in Table 7. The estimated total number of rooms contained in these structures is 318. Without complete excavation, however, it was very difficult to locate interior partitions in the pile of debris formed by a vaulted building. For this reason, the estimated number of rooms is not very accurate. The location of exterior walls, however, was relatively easy. For this reason the exterior dimensions of the buildings are a more accurate estimate of the size of the structures than the estimated number of rooms. Vaulted buildings seldom vary much in room width, therefore, the size of vaulted buildings is adequately reflected in the length of the vaults alone. The total length of all vaulted rooms at the site, as mentioned earlier, is 4,642 meters. Early Period vaulted structures have a combined vault length of 2,730 meters. Thus, about 58% of all vaulted architecture at the site is Early Period style.

All of the Early Period vaulted buildings at Dzibilchaltun are thought to date from Early Period Phase II. The reasons for this conclusion are listed below: Pottery samples were taken from
67 of the 150 Early Period vaulted structures at Dzibilchaltun; in not one case was there any Early Period Phase I pottery associated with architectural construction. As shown in the preceding chapter, very few structures at all contained Early Period Phase I pottery. The small amount of architecture representing Early Period Phase I construction at the site was unvaulted or thatch roofed. Moreover, the totally excavated structures like the Temple of the Seven Dolls that are believed to date from the initial part of Early Period Phase II exhibited features that Andrews (1968:42-43) deemed experimental. Doorways were often too wide for their wooden lintels and the walls were not thick enough to support the tremendous weight of the vault. The Temple of the Seven Dolls includes features such as a vaulted corridor that turns 90° at each corner to surround an interior room and four huge doorways with wooden lintels. Even windows are present. Such features caused the Temple of the Seven Dolls and the buildings surrounding it to become structural failures. These experimental buildings are thought to have been among the first vaulted structures at Dzibilchaltun. The conclusion based on this evidence seems clear: all known Early Period vaulted architecture at the site was erected during the Early Period Phase II (Andrews 1965).

Some vaulted buildings combine features characteristic of both Early Period and Pure Florescent masonry (Andrews 1965:311-313). Fourteen structures are in this category; they total approximately 37 rooms and 296 meters of vaulting. Their location, size, and
substructure type are recorded in Table 8. Usually these structures were found with concrete-veneer walls capped with true corbelled slab vaults. These structures are considered transitional between the two styles, though assignment of this temporal position rests on serriation of the architecture alone. While some scholars may not consider this evidence conclusive, it may be useful to consider these 14 structures apart from the other vaulted architecture. In the tables and on the maps, these buildings are listed under the label "Transitional" or "Transitional Early Period-Pure Florescent".

Seventy-three Pure Florescent vaulted buildings with a total of about 181 rooms are plotted on the map. Their individual location, size, and substructure type are recorded in Table 9. If the vaults utilized in the construction of Pure Florescent buildings at Dzibilchaltun were laid end to end, the total length would be over 1,584 meters. This constitutes about 34% of the vaulted architecture at the site.

Though Dzibilchaltun continued to be occupied during the Modified Florescent Phase, no vaulted buildings were erected at that time. Some vaulted structures built earlier however, were used during this phase judging from the Modified Florescent pottery found in them.

Only three vaulted buildings are known to have been built at Dzibilchaltun after the end of the Pure Florescent; their location is recorded in Table 10. These buildings contained Black-on-Cream (Haaz) pottery sealed under floors or other constructional features (Andrews 1965). This kind of pottery, termed "course slateware"
by Brainerd (1958), is very easy to recognize. The Black-on-Cream wares date from a period transitional between the Modified Florescent and the Decadent phases. No Decadent vaulted buildings were built at the site, though several vaulted structures were used and modified at that time.

Examination of the vaulted buildings at Dzibilchaltun resulted in the definition of several contrasts between Early Period Phase II and Pure Florescent structures. First, there is a marked difference in their spatial distribution. Secondly, far more vaulted architecture was constructed during the Early Period than the Pure Florescent. Thirdly, though the largest structures at the site were erected during the Early Period, Pure Florescent vaulted buildings are in general larger than Early Period structures. Lastly, more vaulted structures were placed on high substructure pyramids during the Early Period than the Pure Florescent.

A glance at the map of Dzibilchaltun would show that the spatial distribution of vaulted buildings is centered near Cenote Xlacah in the middle of the main group of buildings (See Figure 26). Over 80% of the vaulted buildings are located within 0.5 kilometers of the three main causeways that intersect near the cenote. The remainder of the vaulted structures are scattered in small groups or stand by themselves in locations over the entire site. A few of the vaulted buildings are quite isolated, in locations a half a kilometer from any other vaulted building. Inspection shows that few Pure Florescent vaulted buildings are located away from the center of the
site. Pure Florescent architecture is far more concentrated than Early Period architecture. The following chapter will elaborate on this point.

The amount of architecture erected during the Early Period and the Pure Florescent also contrast. The total number of buildings and the number of buildings weighted by size when compared with one another show that slightly less than twice as much vaulted construction took place during the Early Period Phase II as was carried out during the Pure Florescent Phase. Several factors might account for this observation. Most students of Maya Prehistory would probably agree that in contrast to Early Period structures, greater amounts of energy for most phases of construction, greater skill, and perhaps a higher degree of occupational specialization are necessary for the erection of Pure Florescent vaulted buildings. I speculate that the social organization of the construction of these two kinds of buildings may have been very different. Perhaps the total amount of energy expended in the building of vaulted structures during these two phases, which are almost equal in time spanned, was the same.

Comparison of the size of Pure Florescent and Early Period Phase II vaulted buildings is shown in Table 11 and Figure 17. The median vault length for Pure Florescent structures is 19 meters while the median length for Early Period structures is 16 meters. Note that the histograms in Figure 17 showing the distribution of vault length are skewed in opposite directions; Pure Florescent structures are more frequently larger while Early Period Phase II
structures are smaller. The thirteen largest Pure Florescent structures, constituting some 34% of the total amount of Pure Florescent vaulted architecture (approximately 1,584 meters) have vault lengths of 72, 50, 44, 44, 42, 42, 37, 36, 36, 36, 34, 32, and 32 meters respectively. The ten largest Early Period vaulted structures constituting 24% of the total amount of Early Period vaulted architecture (approximately 2,640 meters) have vault lengths of 208, 118, 54, 48, 46, 37, 35, 35, 35, 30, 30, and 30 meters. Thus, while the largest structures at the site are Early Period, a far higher percentage of the Pure Florescent structures are larger buildings than those of the Early Period.

Vaulted buildings at Dzibilchaltun were placed on substructures ranging from high pyramids to terraced areas only a few centimeters high. Five vaulted structures were erected on pyramids 6 or more meters high. Some of the other impressively large vaulted structures were built on smaller pyramids and unusually large platforms; perhaps 53 buildings could be placed in this category. But 170 of the 240 vaulted buildings at Dzibilchaltun were situated on low platforms or terraces, often sharing their substructures with less majestic unvaulted construction.

Of the 5 vaulted structures on pyramids six meters or more high, only 1 was a Pure Florescent building. Its substructure was 6 meters high; the other Early Period substructures in this category were by contrast 13, 8, 7, and 7 meters high, respectively. Of the 14 vaulted structures erected on substructures 4 or more meters high, only 4 were Pure Florescent. There seems then, to have been
a tendency away from the construction of large pyramids during the Pure Florescent.

Many vaulted structures from Dzibilchaltun have been described in the literature (cf. Andrews 1965). Very complete and detailed descriptions of both Early Period and Pure Florescent structures excavated at the site are presented by Folan (1969). One Early Period vaulted building from the site is described below, more to illustrate what a collapsed building is like than to present complete structural details.

**Structure 784.** J802q247. (See Figure 18). This structure is a late Early Period vaulted building situated some 650 meters east and 300 meters north of the Temple of the Seven Dolls. A group of three vaulted structures on a single large platform stands a short distance to the northeast, but the nearest other vaulted building is located over 250 meters away. Structure 784 stands on a large low platform, 21.5 meters long (with its axis oriented North 3° East) and 20.8 meters wide. The retaining walls average 0.5 meters high and are composed of one or two courses of unworked slabs. There are two steps on the west side of the platform. A small terrace, slightly lower than the original platform, extends from the south side of the substructure.

The vaulted superstructure is situated about 2.5 meters from the east side of the platform, facing west. The building is approximately 18 meters long and 3.3 meters wide. Its walls consist of a double thickness of fairly evenly coursed horizontally laid blocks that were slightly dressed on the exterior faces only. The
thickness of the walls is 0.7 meters making the width of the area spanned by the vault 1.8 meters. The vault itself had completely collapsed, but test-pitting showed that it was of the corbelled slab variety. Limited digging uncovered only one of the interior partitions, but the structure is probably divided into three almost evenly sized rooms. No doorway passes through the partition examined. Three doors are symmetrically placed along the front of the building: one at the center and two approximately 3 meters from the north and south corners. The doors are 0.8 meters wide. The blocks from which the jambs were constructed are neatly dressed and squared.

When the structure was test-pitted by Cottier, a hard plaster floor was encountered 1.12 meters below the surface of the rubble. The material above the floor was debris from the vault fall. One sherd at this ruin may have been Formative; the remaining 114 pottery fragments collected on the surface and in the test-pit were typical Copo material.

**Summary**

The late Classic buildings at Dzibilchaltun are characterized by variety in form and method of construction. Substructure platforms of many sizes were utilized as foundations for some of the buildings, while others were erected on the ground surface without substructures. Thatch-roofed structures had walls ranging from relatively flimsy wattle-and-daub to fine masonry. Single-roomed buildings were the most numerous, these were both apsidal and rectangular in groundplan. Multi-roomed thatched buildings were also abundant.
The most carefully constructed buildings at the site consisted of vaulted architecture. Through time, these structures became more concentrated in space at the center of the site. The size of the buildings also increased. Progressively fewer structures were erected on high pyramidal substructures as time passed.

Metates were found in or near buildings of all categories listed above. Two pottery forms, Unslipped Striated Utility Jars and Medium Slateware Bolster Rim Basins were abundant in the ceramic collections taken from these structures. Both of these pottery types have been considered largely domestic in their function. It is reasonable to argue on this basis that some or most of the structures in all of the categories described in this chapter once served as homes.
CHAPTER XII

PATTERNS (ARCHITECTURAL DISTRIBUTION)

Many scholars have written about the form of the ideal lowland Maya community. Landa (Tozzer 1941:62) wrote that Maya towns at the time of contact were centered about temples; near these temples lived the priests, nobles, and the wealthy while farther away lived the poor. Sanders and Price (1968:147-148) state that there is a tendency for all preindustrial urban centers to have such a pattern of concentric zones with people of the highest status levels situated nearest a sacred center zone. Others have pointed to the existence of Precolumbian neighborhood divisions or barrios. Most specific of these was Michael Coe (1965:107) who suggested that the ideal Maya community was divided into four such barrios or wards. These wards, he implied, were more or less equal in status and prestige. The works cited above all describe the form of the ancient Maya community; they describe how these Maya societies used the space on which their communities stood.
All of the statements about the form of the ideal ancient Maya community imply that the space occupied by such a community was divided into parts that were used in certain culturally patterned ways. Coe's analysis would suggest the presence of at least four distinct areas, each of which was utilized in much the same manner. Sanders and Price's statement would indicate the presence of a central area that was used in a manner different from the areas surrounding it.

The artifacts found in any given area of an archaeological site reflect the use which prehistoric people made of that area. Thus, if one area of a Maya site contrasts in artifactual content with another, we may infer that the use(s) to which these areas were put also contrasts. If the content of the areas are similar, we may infer that the manner(s) in which the areas were used were also similar. Thus, patterns or regularities in the distribution of artifacts in space may be relied upon both for definition of the parts of a large and complex site and as evidence concerning the ways in which these parts were utilized.

This part of the dissertation examines the spatial distribution of a specific category of artifacts at Dzibilchaltun. This category consists of building remains. The building remains shown on the map of Dzibilchaltun may be considered the remnants of a late
Classic settlement. The purpose of the examination is to learn if that settlement can be divided into component parts and determine if these parts are similar or different in architectural content. The method will be to define areas of the settlement using various kinds of criteria. Next, the buildings in these areas will be compared and contrasted. From the comparisons and contrasts, a statement about the form of the late Classic settlement at Dzibilchaltun will be derived.

It is assumed, if culture is viewed as an integrated whole, that the form of the late Classic settlement at Dzibilchaltun is related to the organization of the social community that occupied the settlement. Buildings and groupings of buildings that make up the component parts of the site were utilized by large and small groups of interacting human beings. The nature of these groups, their size and their function, is reflected in the architecture once used to house their activities. The examination proposed above will therefore produce evidence directly linked to the problems of lowland Maya social organization examined in the introductory chapters.

The most critical operation involved in the task that has been outlined is the determination of spatial boundaries. By what criteria can the site be divided into component parts? The rationale for the criteria used to establish boundaries for component parts or divisions of the site in this study is found in cross-cultural regularities with respect to man's use of space examined by writers
like Hall (1966), Lévi-Strauss (1967), Rappaport (1969) and Chapple (1970). The work of these men indicates that human beings systematically erect barriers that impede interaction with people situated outside the barriers. Interaction between people within the barriers is thereby enhanced. The most elemental barrier used by humans in such a manner is space itself, for distance between people limits interaction and proximity encourages it. The culturally determined distribution of humans through space then, is one way that people erect barriers to social interaction. Physical barriers, such as the walls of buildings, are another. Even when human beings are in situations of proximity and physical barriers are not present, social conventions that may be viewed as cognitive barriers impede forms of interaction not appropriate to the culturally defined manner in which given areas of space are to be used. The patterns of interaction that give social groupings occupying a church or courtroom their distinctive character are largely determined by such cognitive barriers. This kind of social convention keeps men on sidewalks and off lawns even if no fence or other formidable barrier is present.

Both the form of the barriers mentioned above and the distinct manner the space they enclose is utilized are important aspects of any cultural system. A spatial sector determined by these barriers and utilized in a given manner tends to be contrasted in the thinking of people in a society with space utilized in other ways. For this reason, I maintain that sectors defined by empirically
determined boundaries at Dzibilchaltun are congruent with sectors of space that had cognitive significance in late Classic Maya thinking.

Four criteria are used here in order to distinguish spatial boundaries at Dzibilchaltun. The first kind of spatial boundary consists of walls of the individual buildings themselves. The content and form of individual buildings, the units of space enclosed by these boundaries, is examined in the previous chapter. The distribution of the building types is described below. The second kind of spatial boundary is the edges of platforms and terraces. Often several buildings are grouped on such platforms or terraces; the terms "platform complex" and "terrace complex" are used to designate this kind of grouping. Even if the edges of a platform or terrace are not high barriers that needed to be ascended, as indeed they sometimes are, they are at least the edges of areas made for and controlled by certain prehistoric social groups. As such, these edges were probably cognitive barriers of the kind referred to above. The third criterion is proximity; often groups or clusters of buildings are found isolated from other clusters. The space between the buildings constitutes the barrier. The fourth criterion is architectural content itself. Concentrations of some kinds of architecture stand out as special precincts at the site. In these cases it can be both terrain devoid of mapped architecture and terrain filled with contrasting architecture that provides the actual boundaries. The boundaries conceptualized by use of this criterion, of course, are far more elusive or vague than those resulting from use of the other three
criteria. Levels of architectural grouping determined by utilization of building walls, terrace edges, proximity, and content for determination of boundaries are discussed in the following pages.

**Platform and Terrace Complexes**

Platform and terrace complexes are small groupings of two to sixteen or more buildings situated on the same substructure. The buildings in such groups are surrounded by the retaining walls of the substructure; these retaining walls act as both physical and cognitive barriers to interaction. This would suggest that all of the buildings on such substructures were probably utilized by culturally standardized groups.

The groups called platform and terrace complexes vary from small platforms supporting the remains of only two simple, single-roomed thatched structures to large ones supporting many vaulted structures. Some of the largest concentrations of vaulted architecture at the site fit the description of this category. A special form of the platform and terrace complex category are the large plazas filled with vaulted architecture connected by raised causeways or *sacbeob* at the center of the site. Thus, like the individual buildings themselves, the groupings of architecture called platform or terrace complexes range from very expensive to very inexpensive in terms of energy cost.

While some structures at Dzibilchaltun are situated in platform or terrace complex groups, many others are not. The orienta-
tion of structures within platform or terrace complexes is carefully arranged; the structures are placed with their long axis parallel or perpendicular to each other. Structures outside such groupings, even if they are close together, do not usually exhibit such patterned organization.

One other regularity is characteristic of the platform and terrace complexes. In addition to the careful orientation of the constituent architecture exhibited in even the smallest platform or terrace complex, many groups seem to have a pyramidal substructure constructed on their east side. This is true of groups consisting entirely of unvaulted architecture, groups consisting of predominantly vaulted buildings, and even groups connected by sacbeob.

Platform and terrace complexes are considered together because they are not mutually exclusive categories; one grades into the other. Terraces are defined as particularly large areas bound by very low retaining walls usually not more than a few centimeters high. Platforms are smaller and higher. The retaining walls of these two kinds of substructures delineate the most clearly defined groupings of architecture at Dzibilchaltun.

A total of 846 individual structures arranged on 261 platform or terrace complexes are found on the map of Dzibilchaltun. These figures do not include the large terraces at the center of the site connected by sacbeob, these "sacbe plazas" will be considered separately. Nor do the figures include the larger platforms on which no remains of superstructure masonry was encountered, though these larger platforms
and terraces did probably support more than one superstructure. A number of other ruins are spaced and oriented in a manner similar to those structures elevated on the same platform complex. A few adjacent platform or terrace complexes were oriented in much the same manner; perhaps these were once part of the same larger complex. Though the formal boundary, a retaining wall, was not present in the above cases, it is clear that many more structures may have been functionally the equivalent of platforms or terrace complexes. The arbitrary definition of such groups causes tabulation of them to be very difficult. The existence of many more groups like the platform or terrace complexes however, must be taken into account in any attempt at interpretation.

The platform and terrace complexes include many that are small and inexpensive in terms of energy cost and relatively few that are large and expensive in terms of energy costs. The size and energy cost of the groups is reflected below in two ways. First, the total number of buildings per platform or terrace complex is examined. Then the amount of vaulted architecture on those platforms or terraces that support such buildings will be examined.

The size of 261 platform or terrace complexes (excluding those complexes connected by sacbeob) in terms of the number of constituent buildings is shown in Table 12. Most of the structures in the size categories that contain the largest number of groups are small unvaulted buildings. Two single-roomed apsidal structures on a single relatively small platform constitute 25 of the complexes.
Eleven others consist of two apsidal structures on a somewhat larger platform. Slightly larger complexes are often two or three single-roomed or multi-roomed rectangular unvaulted structures along the sides of a large platform. Only 53 of the complexes described in the following table contain vaulted architecture; this includes all of the complexes containing six or more buildings. About 41 other platforms support only a single vaulted structure.

Figures 19-21 show the amount of Early Period Phase II, Pure Florescent Phase, and total vaulted architecture on terrace complexes and their distribution. The area of each black circle on the maps in Figures 19-21 is proportional to the total of the vault lengths of the buildings erected on the same platform or terrace. Here platforms containing only one structure are included if that structure was vaulted. Sacbe plazas are also included. Where it is hard to find the terrace edges that isolate one group from another in the central group, all the architecture around a particular court or plaza is grouped together.

Figures 19-21 reflect an increased concentration of vaulted architecture in space as time progresses: the Early Period architecture, while concentrated at the center of the site, is far more widely distributed than the Pure Florescent architecture. Note that very few platforms or terrace complexes away from the center of the site containing Early Period vaulted architecture had Pure Florescent buildings added to them. This observation will be considered again below. The Figures also show that the platform and terrace complexes
vary greatly in the amount of vaulted architecture they contain.

As noted above, a pyramidal substructure one or more meters high is often a part of the platform and terrace complexes. These substructures are only rarely well-preserved; usually mounds of rubble without visible structural details mark their location. Structure 38 (J538o862), described in detail by Folan (1969) and Andrews (1962:153-154) is typical of this kind of architecture. Similar construction, though most often crowned by unvaulted buildings, is encountered at 85 of the 261 platform and terraced complexes described in Table 12. Twenty of these substructures are platforms for vaulted buildings. Most often, these substructures are situated on the east sides of the complexes and face west, especially if only one such building was present. This is true of some of the smallest pyramids in the smallest platform and terrace complexes as well as some of the largest pyramids in complexes of vaulted architecture or sacbe plazas.

Three observations about platforms and terrace complexes are presented in the preceding paragraphs. First, these groups of buildings range from expensive to inexpensive in terms of energy cost. Second, the groups are characterized by orderly arrangement of constituent architecture. Third, a small or large pyramidal substructure is often present on the east side of such groupings. The observations are illustrated in the description of two typical platform and terrace complexes given below. Examination of the map provides numerous other examples.
Structures J865p590, J877p572, J883p582, and J883p587. (See Figure 22). This group of structures is located some 340 meters due north of the Temple of the Seven Dolls. The area around the group contains many other unvaulted buildings and platforms, but the nearest vaulted structure is some distance away.

All of the structures occupy the same low platform. It is oriented with its long axis slightly east of north. The platform is basically rectangular, measuring 39.5 meters long by 30.5 meters wide. The retaining walls consist of a single course of horizontally laid or upright slabs, averaging 0.25 meters high. At least four buildings were constructed on the platform. On the east side, adjacent to the southeast corner, is a platform with none of its retaining walls intact. The highest part of this ruined superstructure measured approximately one meter above the larger platform surface; its horizontal dimensions were 9 meters by 6.5 meters. South of and adjacent to this was a lower section of the superstructure 0.3 meters high, 9.5 meters long, and 5 meters wide. Another long rectangular platform, 11.3 meters by 3.1 meters, extended along the west side of the larger main platform. Its retaining walls were made of small upright and horizontally laid slabs, averaging 25 centimeters high. Two small single-roomed rectangular unvaulted buildings, one facing south and measuring 4.9 by 3.8 meters, the other facing west and measuring 5.5 by 3.9 meters, were situated on the north side. Only the basal courses of these houses remained intact. They consisted of a single or double row of thin, low, upright slabs. Very little
rubble was present; most of the walls of the buildings were probably constructed of wattle-and-daub or some similar materials. There is a small cenote a few meters from the platform. Its mouth is lined with masonry.

None of the structures in this complex was test-pitted, but several slateware and unslipped striated utility jar sherds were present on the surface, indicating an Early Period II or Pure Florescent (Copó) affiliation.

Structures K3501816, K3681827, K3751803, and K3851817. (See Figure 23). These structures are approximately 1.5 kilometers west and 850 meters north of the west terminus of the axial sacbe. The group contains the largest ruins in that vicinity, but many smaller ruins are nearby.

The structures are situated around a plaza. A low retaining wall defines the edges of the plaza on the north and west sides, but no walls were found elsewhere. Much of the plaza was paved with gravel and probably plastered (though no plaster was found).

Structure K3501816, at the south side of the group, is a long rectangular unvaulted building on a low platform. Only parts of the basal course of its masonry remain intact; most of this basal course consists of upright slabs. An interior partition divides the dwelling into two rooms. The entire structure measures approximately 11 meters long by 3 meters wide. Three doorways were probably present, although the location of the two nearest the ends is conjectural. A lower terrace is found adjacent to the front.
Structure K3571830 (Structure 6026) is on the east side of the plaza and faces west. Its rubble indicated the remains of a very small apsidal structure 4 meters long and 3.7 meters wide. The building appears too small to have been a house. It was test-pitted, yielding 32 sherds. Most of them were either unslipped or eroded, but all those identified were late Early Period or Pure Florescent (Copo) types.

Structure K3681827 is a small well-built rectangular unvaulted building constructed on a small high platform. It is on the east side of the plaza, facing west. The walls of the structure are 5 meters long and 3 meters wide. They were probably entirely of masonry. The blocks were dressed and neatly coursed. The platform is 1.25 meters high with a stairway of five rises.

Structure K3751803 (Structure 6025) is a long narrow platform on the west side of the plaza. It was built in two levels: one section on the north side is 13 meters long, 4.8 meters wide, and 0.3 meters high, while the smaller section on the south side is 7.4 meters long, 4.8 meters wide, and only a few centimeters high. The retaining walls were all one course high. Fourteen Copo sherds, including one fine Orange fragment, were collected on the surface.

Structure K3851817 occupies the north side of the plaza. It was an Early Period vaulted building 10.7 meters long and 3.8 meters wide. Neither the location of the doorway(s) nor presence of interior walls was determined. Twenty-eight Copo sherds, mostly slateware or unslipped, were found on the surface of the structure.
Clusters of Ruins

Examination of the map of Dzibilchaltun will reveal at least some thirty "clusters" of ruins. The size of these clusters varies from ten structures in a small area to over a hundred buildings covering an area of several hectares. Often the larger clusters seem to be formed of two or more smaller clusters that have grown together.

The clusters that appear on the map can be formally defined by two criteria. The first of these is spatial isolation; the clusters are separated by space containing no architecture. The second criterion is the presence of substantial architecture, vaulted buildings or larger unvaulted structures, at or near the cores of the clusters. In some measure, use of these two criteria may have been inadvertently compromised by our fieldwork. Both surveying operations and test-pitting in almost any area of the map were based at the larger groups of ruins; therefore, it was the areas nearest the groups of substantial architecture that were most carefully searched. Some of the empty space between clusters may well be an artifact of our fieldwork. It is virtually certain however, that no substantial ruins were missed by the surveyors. It is also clear that many groups were isolated by space empty of architecture from other groups.

The clusters of ruins must have been related to the organization of the groups that made up Maya society at Dzibilchaltun. The criteria by which these clusters are defined consist of the kinds of phenomena used by men to create the boundaries between groups
referred to at the start of this chapter. First, empty space surrounding these clusters formed a physical boundary or barrier enhancing interaction within the architectural group and impeding it with persons outside the group. Second, the presence of substantial architecture in many of these clusters, at locations far from other substantial architecture, must have been recognized in the spatial taxonomies of the Maya who lived at Dzibilchaltun. Even if the clusters were not spatially isolated, we could be sure that subdivisions of the large site would have been marked by the various grades of component architecture.

While the groupings of architecture termed platform and terrace complexes are characterized by careful arrangement of their buildings, the clusters of ruins described here are not. Except for the structures on terrace complexes forming part of these clusters, haphazard distribution and orientation within the clusters is the rule. The only organization that may have been present is a sort of "concentric zoning"; larger and more substantial architecture within these clusters seems to have been surrounded by less substantial construction.

As in the instance of individual ruins and platform or terrace complexes, clusters of ruins range from a few that contain a great deal of architecture to many that are much smaller. In terms of energy cost the clusters vary from relatively expensive to relatively inexpensive. This is most easily observed in the amount of vaulted architecture contained in the groups; vaulted buildings are found at only a few of the clusters outside the main group.
Figure 24 illustrates the distribution of clusters of architecture on the map of Dzibilchaltun. It was made by drawing a smooth curve or "contour line" around every 1/4 hectare containing architecture and filling the areas within the curve with diagonal lines. Black circles mark the approximate locations of individual vaulted buildings; comparison with the map on Figure 21 would indicate the relative amounts of vaulted architecture present. The location of concentrations of other substantial architecture can be approximated by comparing Figure 24 with one of the maps showing the location of structures where excavation, surface sampling, and architectural investigation took place. Clusters of circles on these maps represent intensively examined areas which usually contained considerable amounts of substantial unvaulted architecture. This may be confirmed by reference to the published map. Areas on the map in Figure 24 that have been left blank, of course, are places where no architecture was found.

Figure 24 is an illustration that supports the contention that clusters of ruins isolated by space contrast in size and energy cost. Some isolated clusters contain vaulted architecture in varying amounts while others do not. The areas covered by some clusters are small while those of others are large. The size of the areas involved would usually be related to the number of buildings present.

An example of a ruin cluster isolated by space and distinguished by substantial architecture at its core is found about 2.6 kilometers southeast of Cenote Xlacah. Most of this group is plotted on the southeast corner of kilometer 1 north and 9 east on the map.
A few structures that form part of this cluster are not shown on the present version of the map, for the cluster extends beyond the south edge of the map sheet. This cluster contains two large terrace complexes. One of them includes 7 vaulted structures, six constructed during Early Period Phase II and the other during the Pure Florescent Phase. Numerous unvaulted structures, apsidal and rectangular single-roomed buildings as well as multi-roomed rectangular buildings that once had thatch roofs, are situated about the two larger terrace complexes. There are about 125 ruined structures in all. The areas adjacent to this cluster were most carefully searched; the surveyors were convinced that there were no building remains in these adjacent areas.

A reconstruction drawing of this cluster made by John Scheffler is included as Figure 25. The artist faces southwest; some of the less substantial structures on the north side of the group are behind him. The buildings on the south side of the complex, including those off the map, are included in the artist's field of vision. The most important feature illustrated by this drawing is the contrast between the careful and orderly arrangement of buildings that form the terrace complexes and the "disorganized" layout of the cluster as a whole. While I realize that "disorganized" may be a value-laden term, and emic data would probably provide the key to an organizing principal behind the layout of the structures in the clusters, the empirical contrast is demonstrable and must have been reflected in Maya thinking.
Spatial Distribution of Building Types

For the purpose of inspecting the distribution of buildings at Dzibilchaltun through time and space, the structure and substructure types can be collapsed into two categories. Two distinct types of architecture are found at Dzibilchaltun: vaulted buildings and unvaulted or thatched buildings. This second category includes the numerous small platforms plotted on the map, for it is assumed that some kind of unvaulted building once stood on every platform encountered by the surveyors.

The following pages examine the distribution of only the vaulted category of buildings. Unvaulted ruins are not treated because the author is not confident that the map he helped to make accurately reflects the distribution of the less substantial buildings in this category. By "less substantial buildings", I mean the structures described in our field notes as "low simple platforms, with no remaining retaining walls." Most of the structures plotted on the map are in this group. Moreover, it is virtually certain that many unvaulted buildings once stood where nothing now remains to mark the spot. I doubt therefore, if complete data on the distribution of unvaulted structures can ever be collected. But almost all of the vaulted structures in the area covered have been located and mapped. As shown in the previous chapter, these structures are concentrated near Cenote Xlacah at the center of the site. Their distribution therefore, contrasts with the distribution of unvaulted buildings. For these reasons, a detailed study of the spatial
distribution of vaulted buildings at Dzibilchaltun is presented below in order to provide additional contrasts that might be interpreted in social terms.

Vaulted buildings have thick walls to support their heavy masonry roofs. The combined weight of the walls and roofs make it mandatory that special care be taken in the construction of every feature of such buildings. Structural failure of any component part of a vaulted building could and often did cause it to collapse. The walls of unvaulted buildings were less substantial and far less time and material was involved in the construction of their thatched roofs. The amounts of energy expended in the construction of these two categories of buildings contrast greatly.

Buildings of any type are a highly visible form of wealth reflecting on the status of the social groups that control them. Vaulted buildings represent a particularly great expenditure of energy on the part of their builders; as such, vaulted buildings were an important form of wealth in ancient Maya society. Thus, examination of the distribution of these structures over the map of the site may be considered a study of the distribution of wealth over a large area utilized by these people. The amount of architecture in any part of the map would also be a criterion of the status of the social groups whose activities occupied that area.

The style of construction of vaulted buildings at Dzibilchaltun, as explained in detail in the preceding chapter, changed through time. The style of construction and consequently the approximate
date of construction was determined for all of the vaulted buildings on the map. These data give an added temporal dimension to the study of spatial distribution.

The vaulted buildings, it has been argued, may be considered a form of wealth. Their distribution in space reflects the spatial distribution of wealth. Concentrations of vaulted architecture on the map would indicate the presence of precincts or subdivisions of the site characterized by concentrations of wealth.

When the distribution of vaulted buildings by style of construction is examined, these data reflect the distribution of wealth in both time and space.

The simplest way to study the distribution of the vaulted buildings on the map of Dzibilchaltun is to: (a) locate the middle of the vaulted buildings and (b) examine the frequency distribution of the distance of the structures from that point. The map coordinates for the center of each vaulted building found by the surveyors had been determined for easy reference to each structure on the map. Thus, each structure is represented by a single point in a Cartesian grid system. Finding the centroid of the structures in such a system is a simple matter of averaging the coordinates. A more precise centroid can be found by weighting each coordinate by the amount of architecture in each building. Determining the distance of each structure from the centroid is also an easy mechanical or mathematical procedure. Completion of these operations resulted in the following observation.
The Pure Florescent vaulted buildings are far more concentrated in space than the Early Period vaulted buildings. The mean distance between the 150 Early Period vaulted buildings and their centroid is slightly less than 1.1 kilometers while the mean distance between the 73 Pure Florescent vaulted buildings and their centroid was slightly more than 0.5 kilometers. This contrast is heightened when the median distance is examined—838 meters for the Early Period vaulted structure that is at the middle of the distribution and 359 meters for the Pure Florescent building that is at the median distance from the centroid. Examination of the map shows that much of the Pure Florescent architecture at Dzibilchaltun is concentrated in a small area centered south of Cenote Xlacah; the Early Period vaulted buildings, while concentrated in that same general area, are found in numerous groups over the entire area surrounding the causeways at the center of the site and the entire map as a whole. This observation is clearly reflected in Figure 26, a chart showing the location of the vaulted structures by type, and Tables 13 and 14.

If vaulted buildings are considered a measure of wealth at the site, the larger buildings would indicate greater wealth. The size of the vaulted buildings are easily compared by examination of the total length of the vaults utilized in their construction. The combined vault lengths of all of the Early Period vaulted structures shown on the map is 2,730 meters. The sum of the vault lengths of Pure Florescent vaulted buildings is 1,584 meters. The percent of the total amount of Early Period or Pure Florescent architecture
represented by any building at the site then, can be calculated by dividing the vault length contained in the structure by the total amount of vault length erected during that period.

Analysis of the distribution of vaulted buildings weighted by size results in observations similar to those reported above. Table 15 shows the percentage of Pure Florescent architecture found within various distances from the centroid of Pure Florescent architecture. This is compared with the amount of Early Period architecture found within that same distance of the centroid of Early Period architecture. The total amount of Pure Florescent architecture on which the percentages are based is 1,584 meters, while the sum of the Early Period architecture is 2,730 meters. The centroids in each case are determined by averaging the coordinates of the vaulted buildings.

Figures 27 and 28 also illustrate this contrast. Here the centroid of all Classic vaulted architecture weighted by the amount of architecture in each location is chosen as the point from which to measure the distance to all of the buildings. The charts in the figures graph the cumulative percentage of total architecture in the Early Period and Pure Florescent categories within the radius or distance noted on the horizontal axis. The asterisks form the curve for the Pure Florescent architecture while the circles show the percentage of Early Period architecture within the distance indicated.

The table and graphs show that approximately 50 percent of the total amount of Pure Florescent architecture is situated within
355 meters of the Pure Florescent centroid, an area of 0.13 square kilometers. It would take a circle 720 meters in radius to encompass 50% of the Early Period architecture; such a circle would have an area of 0.52 square kilometers. Half of the vaulted architecture built during the Pure Florescent then, is concentrated in an area one quarter the size of the area that contains the same percentage of Early Period vaulted architecture.

Evaluation of the contrasts reported above must be tempered by recognition of two possible arguments: First, it has been tacitly assumed that Pure Florescent and Early Period buildings of the same size cost their builders the same amount of energy expended. This was probably not true. Given the advanced techniques and the neatly dressed and often carved blocks utilized in Pure Florescent buildings, one might suspect that these structures were the result of far more occupational specialization than the Early Period buildings. Both the organization of construction and the energy costs of the two classes of architecture may have been very different. Secondly, the nature of the data used to formulate this contrast made it impossible to demonstrate that the tendency towards concentration of the vaulted buildings in space through time was a progressive trend rather than a rapid change in emphasis. This precludes efficient use of the contrast as conclusive evidence for the steady growth of stratification as the late Classic continued. Perhaps future seriation of the buildings will make this kind of analysis possible, but we do not know which vaulted structures were constructed at what time. Combining these two arguments, one might suggest that it was
only a few social groups situated at the center of the site and already wealthy that could "afford" the construction of Pure Florescent buildings.

**Major Divisions of the Mapped Area**

The distribution of late Classic vaulted architecture as a whole may be seen to divide the mapped area into three parts. Three patterns are clearly discernible in the distribution of vaulted architecture over the map of Dzibilchaltún. First, a glance at Figures 19-21 and 26, the illustrations showing the distribution of vaulted architecture, indicates these buildings are not distributed evenly over the entire map. Instead, most of the structures and most of the total architecture are clustered in an area totaling about 3 square kilometers. The principal causeways are at the center of this cluster. Outside the cluster, a second pattern is found; there small groups of vaulted buildings are widely scattered in a manner that may be described as almost random. Within the 3 square kilometer cluster at the center of the site, the third pattern of the cluster about a quarter of the vaulted buildings on the map are concentrated. This area is about 600 meters in diameter with its center just southwest of Cenote Xlacah. The area contrasts with the other areas of the central cluster not only in the heavy concentration of vaulted architecture there but also in the form of the buildings erected in that location. The "Palace" and the building on the south side of the plaza that contains the Spanish Chapel are the most obvious examples; their form and size are not duplicated elsewhere.
at the site. Most of the stellae from Dzibilchaltun are also found there. I believe the three areas marked by these patterns of vaulted structure distribution, must have been recognized in the spatial taxonomy used by the prehistoric inhabitants of the site. These three concentric areas—the 1/4 square kilometer or slightly larger at the center of the site containing a heavy concentration of vaulted ruins, the three square kilometers containing the cluster of vaulted ruins, and the remainder of the map—must have constituted areas characterized by different levels of community organization.

Summary

Three points summarize the data in this section. First, it is clear that during the late Classic the area mapped at Dzibilchaltun was divided into numerous precincts, neighborhoods, sectors, and special areas. These divisions grade from small to large in terms of the area they cover, the number of buildings they contain, and the amount of wealth represented by the architecture present. These divisions—platform and terrace complexes and clusters—give the map a fragmented appearance that is not consistent with the general notion of what a nucleated community should be like. If the numerous physical and spatial boundaries represented the limits of housing for distinct social groups, the groupings of architecture defined by these boundaries can only be interpreted as evidence for a fragmented or poorly integrated community divided into numerous strong, probably competing social groupings. Indeed, the fragmented appearance of the map has led some authors to suggest that the mapped
area should be considered a number of closely interacting communities rather than a single big one (Sanders and Price 1968:160; cf. M. D. Coe 1966).

The second point, however, concerns regularities in patterns of architectural distribution over large areas of the map. Referring to Figure 21, a chart showing the distribution of late Classic vaulted buildings on the map, we may divide the mapped area into three concentric parts on the basis of the spacing of vaulted ruins alone. An area of unknown extent that includes most of the map contains small groups of vaulted ruins that are widely spaced. This area may be considered the peripheral part of the archaeological zone. A second area, about 3 square kilometers in extent is characterized by a clustering of vaulted ruins. The term "central aggregate" will be used to refer to this part of the map. At the core of the central aggregate is the "central group" where in an area of slightly less than a quarter of a square kilometer the concentration of vaulted buildings is particularly great. While each of these areas were divided into smaller divisions, the prehistoric Maya must have made distinctions between these three areas. The differences in their architectural content certainly indicates the areas were used differently.

The third point concerns the distribution of vaulted buildings in time and space. Through time the construction sites of vaulted buildings become highly concentrated in space. If architecture is viewed as wealth, it is clear that wealth became more concentrated
in space through time. If the amount of energy expended in construction reflects the relative importance of any area, then this evidence suggests that the very center of the site, the central group near Cenote Xlacah, became increasingly important through time.
Prehistorians study the material culture of the past in order to obtain direct evidence concerning the ways of life characteristic of ancient societies and the role played by these societies in man's history. An accepted method for deriving inferences from such archaeological data has evolved. This method is ultimately based on the proposition that cultures, or the standard operating procedures shared by interacting groups of humans, form systems. If cultures are indeed systems of interrelated parts, it then follows that there must be some measure of relationship between the artifacts made and used by men and other facets of their culture.

The methodology of prehistorians consists of comparing the artifacts they examine and searching for similarities and contrasts in the distribution of the artifacts through time and space. The similarities and contrasts between the artifacts and their distribution are then interpreted or explained; often the prehistorian can infer that the contrasts and similarities he detects are closely related to non-material aspects of social life.
Two lines of reasoning are most often used to explain the similarities and contrasts referred to above. If the prehistorian can argue that there is a genetic or historical relationship between the people who created the artifacts he studies and a modern people whose material and non-material culture can both be examined, then regularities noted in the social life of the observed society may be used to interpret the analysis of the artifacts remaining from the prehistoric society. The second line of reasoning relies on cross-cultural regularities resulting from the study of living humans. Students of society have often found relationships between certain environmental factors, patterns of distributing humans through space, economic practices, or social structure. These regularities are also used to explain or interpret similarities and contrasts in the archaeological record.

In this dissertation I draw inferences from both the behavior of the modern descendants of the Classic Stage lowland Maya and regularities found in the behavior of mankind as a whole. For example, I argue that the analogue of the prehistoric apsidal structures at Dzibilchaltun is found in the thatched, round-ended houses used by the Yucatecan farmers today. The ruined apsidal structures at Dzibilchaltun then, must have functioned as houses. This conclusion is the result of the first kind of reasoning, for I argue the case for a genetic relationship between the houses used today in Yucatan and the houses used in that same region from Formative
times to the present. Using the second form of reasoning, I cite authors who note that differential distribution of wealth, power, and prestige in a society are very often reflected in the material wealth represented in the homes used by members of that society. Homes, offices, other buildings, and their contents, of course, constitute wealth in themselves. After finding a contrast in the wealth represented by the various kinds of structures utilized by the prehistoric inhabitants at Dzibilchaltun, I suggest that the social situation reflected by the modern architecture is somewhat analogous to the social situation as it existed at Dzibilchaltun. These propositions will be examined again below.

Summary of the Data

Seven observations can be abstracted from the Dzibilchaltun settlement and community pattern data. These observations summarize the data; they are the most important points presented in the previous chapters. The observations form the basis for interpretations derived in this chapter from the data. They are listed below:

(1) **Number of Prehistoric Structures at Dzibilchaltun.** About 8,400 individual prehistoric buildings are plotted on the map of Dzibilchaltun. There are many good reasons for believing that even greater numbers of buildings were once made and used in the mapped area. Many existing structure remains were not found by the surveyors and there is little doubt that time has obliterated many others completely. Moreover, concentrations of ruins are known to
exist outside the mapped areas.

(2) Contrasts in the Amount of Material Culture Through Time. Excavations for the purpose of finding the chronological affiliation of the buildings plotted on the map indicate about 25% of the structures were made or re-used during the Middle Formative Period, 90% of the structures (or more) were made or re-used during the "late Classic stage" or Early Period Phase II and Pure Florescent Phase, and less than 5% of the buildings on the map were made or re-used at other times in the site's history. In spite of this contrast, considerable evidence indicates the site was quite important at the time of conquest, a period represented by material in only 4% of the collections. Most of the architecture remaining at the site can therefore be considered "late Classic" in its provenience.

(3) Diversity in the Form and Energy Cost of Structure Types. The buildings at late Classic Dzibilchaltun included apsidal and rectangular single-roomed thatched structures, multi-roomed rectangular thatched structures, and vaulted buildings of several sizes. These buildings were both situated on the ground surface and on various kinds of substructures. The amount of energy expended on the construction of these various architectural types varied considerably; the majority of the buildings were inexpensive in terms of their energy cost while a small number of structures varied from expensive to very expensive.
(4) Platform and Terrace Complexes. Often, but by no means always, the individual structures at Dzibilchaltun were arranged in orderly groups that were elevated on the same substructure. These neatly arranged groupings of architecture, called platform and terrace complexes, grade from a small platform or terrace with two superstructures to large platforms or terraces with many superstructures. Numerous vaulted buildings are found in some complexes while only two small structures are found on many others. A special form of these building groups are connected by raised causeways or sacbeob. In terms of the amount of architecture present, these "sacbe plazas" are usually a little larger than those complexes not connected by sacbeob. At the place where the three longest sacbeob come together is the largest of these complexes; concentrated there are the most "expensive" buildings at the site. Like the individual structures, the platform and terrace complexes grade from a few that are relatively expensive to those that are inexpensive in terms of energy cost.

(5) Clusters of Ruins. The entire mapped area, including the parts of the map containing raised causeways, seems to be characterized by clusters of buildings isolated from other clusters by space containing either very few substantial ruins, very few ruins at all, or no ruins. The largest buildings in these clusters have a tendency to occur at or near the center of the clusters. Most often these larger buildings will be situated in one or more
large platform or terrace complex; these complexes often include a pyramidal substructure, an architectural type that must have had a very special function. Except for constituent buildings arranged in platform or terrace complexes, the structures found in these clusters are not oriented or situated parallel or perpendicular to each other. The only perceived organization characteristic of the distribution of buildings in the clusters may be a concentric zoning of buildings in terms of energy cost with the larger buildings at the centers of the clusters. Like the individual buildings and platform or terrace complexes, the clusters of ruins can be graded in terms of total energy cost from high cost clusters to low cost clusters.

(6) Major Divisions of the Mapped Area. The patterns of vaulted structure distribution on the map indicate the archaeological zone of Dzibilchaltun may be divided into three concentric parts. A peripheral sphere that includes most of the map is characterized by widely spaced groups of vaulted buildings. Most of the vaulted buildings observed in the peripheral sphere are Early Period structures. A cluster of vaulted buildings in an area of about 3 square kilometers extent forms an ellipsoid with its center near Cenote Xlacah; this cluster is termed the "central aggregate." At the core of the central aggregate is the "central group," an area of slightly more than a quarter of a square kilometer that contains an unusually heavy concentration of vaulted architecture.
(7) Concentration of Vaulted Buildings Through Time. Pure Florescent vaulted buildings are distinctly more concentrated in space than the Early Period buildings that predate them. Most of the Pure Florescent vaulted architecture at Dzibilchaltun was constructed within or near the central group defined above. Early Period vaulted architecture was concentrated in the central group too, but these earlier buildings are numerous throughout the central aggregate and in small widely spaced groups in the peripheral sphere as well. This contrast in distribution through time reflects relatively greater expenditure of wealth in the area of the central group as the late Classic progresses.

The data just summarized are used below as bases for interpretations related to the problem of Maya social complexity as outlined in the introduction to this dissertation. First, a description of Maya domestic architecture is attempted. This is followed by a discussion of the form of the late Classic Maya community at Dzibilchaltun. The evidence for cultural heterogeneity and social stratification is then summarized. Finally, the case for application of the term "urban" to late Classic Dzibilchaltun is presented. The implications of these findings are then examined.

Maya Domestic Architecture and Residential Patterns

Maya Dwellings. The data examined in this dissertation leave no doubt that there are a variety of building types dating from the Early Period II and Pure Florescent phases at Dzibilchaltun.
Four categories of construction are particularly prominent. One common type consists of platforms ranging from very small and low aggregations of gravel and fill that can sometimes be detected only in trench profiles to large substructures over a meter high and twenty or more meters on a side. It is assumed that those platforms without evidence of superstructure masonry once supported buildings made from perishable materials. Another type of common building consists of single-roomed apsidal and rectangular structures whose roofs were probably thatched and whose walls were both of masonry or wattle-and-daub on a masonry foundation. A third category of buildings includes the multi-roomed structures that were sometimes constructed with masonry walls and sometimes made with walls of wattle-and-daub on masonry foundations. These buildings were also covered with thatch. The fourth category consists of small vaulted buildings whose groundplans are similar to the buildings in the third category.

The first inference that can be derived from these facts is that some or most of the buildings in each of these four categories were used as dwellings. This inference is supported by four arguments: (1) Archaeological content of the structures, especially the presumably domestic pottery, and metates indicate the structures were dwellings. Due to lack of data, this point is probably one of the weaker ones in the argument. More complete excavation of the smaller structures is needed in order to bolster this crucial point.
(2) Ethnological and ethnohistorical analogies support this contention. The presence of clearly apsidal single-roomed buildings at Dzibilchaltun can only be considered evidence for continuity in a tradition of Maya house building that extends from pre-Classic times to the present. The single-roomed buildings at Dzibilchaltun have their direct analogue in the house forms constructed by the Yucatecan Maya today. Moreover, the most common contemporary house type is built almost entirely from perishable materials; the many platforms devoid of superstructure masonry show that this was true in the past as well. The writings of Landa and other sixteenth century authors cited in the third chapter of this dissertation indicate structures much like those in category 3 were used as elite residences. (3) The similarity between the groundplans and distribution of the more neatly constructed buildings in category 3 and those in category 4 suggest that vaulted buildings were also used as houses. (4) All of the forms considered houses are very numerous at the site. That this would indicate that they were used as houses is a proposition called the "principal of abundance" by Haviland (1966a:32), who questioned its validity. The idea at least reinforces the contention that each of these structure types served as houses; I believe that the quantity of buildings in each of these categories would be the basis for a very special problem if further work indicates that any one of these building types was not domestic in function.
Residential Complexes. The structure types noted above and interpreted as dwellings in this dissertation are found in both an isolated context and in groups of two or more. The groups are defined by the retaining walls of terraces and platforms and the orderly arrangement of the constituent architecture. Usually the groups consist of buildings distributed around the sides of a quadrilateral platform or terrace. Sometimes neatly arranged groups of structures lack a platform or terrace; most of these were probably the functional equivalents of the groups defined by terraces. Both the terrace complexes and the groups of buildings showing orderly arrangement alone without a surrounding terrace vary considerably in size, composition in terms of building types, and total energy cost. Buildings within each terrace complex may also contrast in form and cost. The larger and more costly building types, however, seem to be found in groups containing other more costly buildings.

Architectural features not easily interpreted as domestic in function are often found in the complexes noted above. The most important of these features are small and large pyramidal substructures whose form and cost preclude efficient utilization as dwellings. The cost of the substructures is not compatible with the small size of the buildings on their summits. If indeed buildings on such substructures were dwellings, they would have formed a very special class of domestic architecture.
Most authors would agree that the groups of houses on the same platform or terrace were the dwelling places for residential kin groups larger than nuclear families. Both ethnological and ethnohistorical data, summarized in Chapter III of this dissertation, suggest this inference. If this inference is correct, then the size and composition of the residential kin groups in Maya society, if the amount of architecture in the groups are any indication of family size, must have been quite varied. This probably ranged from a relatively few large extended kin groups to many nuclear families living alone.

Traditionally, pyramidal substructure found in this context have been interpreted as ceremonial in function. Their consistent association with residential complexes, especially the larger residential complexes in this category, might be an indication that much of Maya religious ceremonialism was family-oriented. The presumed existence of these extended kin unit dwellings and the presence of ceremonial structures within them certainly supports the suggestion of numerous writers who argue the importance of kinship as an organizing principal in Maya society.

Clusters of Ruins. Especially elaborate examples of the structure types thought to constitute domestic architecture seem to be found within large and small clusters of less substantial architecture. Except for constituent terrace complexes, these clusters are not usually characterized by orderly arrangement. The clusters are defined mostly by space between clusters. The
clusters vary in number, form, and cost of constituent buildings. Usually all of the kinds of architecture interpreted as houses are found in any cluster.

The clusters of buildings that exist on the map almost certainly housed the members of some form of social group. I would hesitate to infer that these social groups were based on kinship, though there is support for this contention in both the ethnological and ethnohistorical data. The position that these clusters are the remains of barrios with an organization based on principals other than kinship seems equally tenable. My impression is that the boundaries between groups of buildings within the clusters are almost stronger than the boundaries between nearby clusters. If the clusters of ruins were indeed inhabited by single kin groups, the internal divisions within the kin group would appear to have been numerous and formidable.

Summary. The architectural types at Dzibilchaltun have led to four inferences about Maya social organization on the family and kin group levels. First, it is clear that many people lived in single-roomed structures not closely associated with other buildings; these people seem to have lived in nuclear family units. Secondly, platform and terrace complexes were probably residences for kin groups consisting of several nuclear families. People living in both extended family units and nuclear families alone were found in the Classic Maya social milieu. Thirdly, clusters of ruins may have housed large kin groups, but it is equally possible that some other
principal was involved in the organization of the social groupings they represent. Fourthly, the variety of architectural types used as housing for these social units indicates that they were extremely diverse in group size on all levels.

Cultural Heterogeneity and Social Stratification

If the inferences concerning Maya domestic architecture presented above are correct, several other inferences may be built on them. It has been inferred that a wide variety of buildings served as dwellings for the Maya. These varied from very expensive to very inexpensive in energy cost. Moreover, considerable differences in the form of the basic residential kin units found in Maya society have also been inferred. Two assumptions follow: first, it would be safe to propose that several life styles were present in ancient Maya society; late Classic Maya culture seems to have been quite diverse in this respect. I believe that this evidence constitutes a good case for the proposition that there was considerable sociocultural heterogeneity at late Classic Dzibilchaltun. The second assumption is that due to the differences in housing "cost", differential access to goods and services must have been a key contrast between these inferred life styles. I believe this implies the presence of social stratification more like that found in preindustrial states than the ranking characteristic of chiefdoms.

The most comprehensive examination of archaeological data reaching conclusions conflicting with the inferences presented
above was the survey of the Peten by William R. Bullard (1964). Bullard's own criteria and logic, as reported in Chapter VIII of this dissertation, were replicated in the formulation of the inferences made here. The difference in conclusions resulted from a difference in scope of investigations; more intensive research in a smaller area led to the discovery of very small house remains.

**Community Form at Dzibilchaltun**

The clustering of vaulted ruins at Dzibilchaltun is the basis for dividing the mapped area into three concentric parts: (1) The central group, a heavy concentration of vaulted architecture in about a quarter of a square kilometer situated near Cenote Xlacah; (2) The central aggregate, a clustering of vaulted ruins in an elongated area over three kilometers in extent surrounding the central group; and (3) The peripheral sphere where small groups of vaulted ruins are widely spaced. The three areas all contained unvaulted ruins, but these were most characteristic of the peripheral area and least frequently encountered in the central group.

Vaulted buildings, it has been argued, reflect wealth and status. The three concentric zones it would seem, were occupied by people of different strata, with the more prestigious groups closest the center. This conforms with Landa's description of the Maya community at the time of contact.

Doxiadis (1970) suggests people form their communities in such a manner as to facilitate safe access to culturally determined
facets of their environment. The form and size of the central aggregate does not allow for efficient access to agricultural fields. Instead, it probably served to allow increased interaction between members of a social elite; other members of the elite were the facet of the environment with whom people living in the central aggregate desired to have facilitated access.

Each area seems to have had strong social subdivisions. The clusters of ruins defined by space between clusters and the large and small terrace complexes distributed throughout these three areas suggest that they were filled with numerous small but strong social groupings. The apparent lack of any superimposed order in the arrangement of the structures and substructure groups together with the emphasis upon physical and spatial boundaries at all levels throughout the site seems to indicate these numerous social groups were only weakly integrated as a single community.

I consider the groups of structures in the periphery of the site an integral part of a single community. Perhaps some authors would prefer to conceptualize the groups of unvaulted and occasionally vaulted ruins in the periphery as separate communities closely integrated with a completely distinct central aggregate. In either case the social system that results cannot best be considered a largely empty ceremonial center surrounded by a dispersed population in satellite communities. The area covered by the cluster of vaulted architecture covers an area far too large and has too many divisions of its own to be considered a single "ceremonial center" at all.
The buildings in the central group alone might be considered a ceremonial center, but the other groups of vaulted buildings in the three square kilometers probably functioned in contrasting manner.

**Population Estimate**

A method for translating the numbers of buildings at lowland Maya sites into population estimates has been used by many authors (Ricketson 1937; Sanders 1963; cf. Thompson 1971). In round numbers there are about 8,400 structures plotted on the 19 square kilometer map of Dzibilchaltun. The number of structures on the map that were not at least partly domestic in function is negligible. Each house therefore, represents a mean number of occupants; the number used for this average in most studies is 5.6 (Haviland 1966a:35). Test-pitting data indicate some 10 percent of the buildings on the map were not used during the late Classic. Subtracting these from the total number of structures and multiplying by 5.6 results in a population estimate of about 42,000. The density of this population would be over 2,000 persons per square kilometer.

Further refinement of this estimate would give only an illusion of more accuracy. It is impossible to account for "invisible structures" (cf. Andrews 1965b:37) on the basis of our present data, though it can be demonstrated that structures leaving no surface trace do indeed exist. Nor is there any way of guessing how many of the late Classic structures at Dzibilchaltun were occupied
at any one time. My impression from a survey of housing at Chablekal is that material from abandoned buildings is usually quickly reused in new structures. This would indicate the number of structures on the map represents the site at its late Classic peak. Any attempt to determine the size of the archaeological zone surrounding the mapped area might best await further fieldwork.

In a recent article, Thompson (1971) cautions Mayanists against estimating the size of populations by counting the number of house ruins containing pottery from a given phase and multiplying by a constant. He presents ethnohistorical data that indicate the lowland Maya at the time of contact abandoned their houses at the death of family members. He further concludes the houses of the social elite may not have been abandoned in such manner; indeed many vaulted buildings contain evidence of interments separated by construction activity. He suggests that the less substantial structures may have been abandoned frequently and their foundations subsequently re-used. This argument would suggest that the above population estimate is in error because many or most of the structures remaining in the archaeological record were never occupied at the same time. This argument is partly answered below.

The data from Dzibilchaltun include another indication of the size of the late Classic population there relative to the size of the site's population at other times. Clearly the late Classic population at the site was much larger than the population at the time of contact. The late sixteenth century church at the site and
the activity known to have taken place there during the Decadent Indicate the site was a community of some importance at the time of the conquest. But the relatively small amount of Decadent material found in the test-pitting operation contrasts with the large amount of late Classic material. As reported in Chapter III, scholars have argued over the estimates of sixteenth century population in both Yucatan and Mexico as a whole. But whatever the size of Dzibilchaltun's sixteenth century population, the late Classic population must have been overwhelmingly larger.

**Maya Urbanism**

The evidence presented in this dissertation suggests that population size, nucleation of population, and social differentiation were far greater during the late Classic Stage than reflected in the presently popular description of dispersed settlement pattern. The complex art, writing, astrology, and religious beliefs known to have been part of lowland Maya culture have led many scholars to conclude that there were indeed folk and urban components in late Classic lowland Maya social organization; the differences in housing examined in this study support the view of these scholars. Specifically the contrasts in the buildings noted at Dzibilchaltun suggest a variety of life styles analogous to the heterogeneity characteristic of urban social patterns.

In spite of the complex material culture of Classic lowland Maya society, a number of scholars have insisted that Maya
communities were not urban in the sense of compact settlements with large populations. This position is not compatible with the data from Dzibilchaltun. The demographic criteria necessary for application of the term "urban" to a community is presented in a review of definitions by Schaedel (1968). By the time a population density of 2,000 persons per square kilometer is achieved, he suggests the community is recognizably urban. Moreover, the social phenomena considered characteristic of urbanism seem to begin appearing in communities with total populations of only 2,000 and become pronounced in communities of 10,000. The data presented here suggest these minimum demographic requirements for urban status are surpassed by Dzibilchaltun.

There is another way of estimating the relative urban status of Dzibilchaltun. Most authors note that there is a striking contrast in this respect between the urban Postclassic site at Mayapan, Yucatan, and the other non-urban Classic "ceremonial centers". A comparison of the maps of Mayapan and Dzibilchaltun may be used to re-examine this contrast. Certainly the amount of monumental architecture at the center of Dzibilchaltun is far greater than the small number of diminutive buildings at the core of Mayapan. The vaulted architecture interpreted as housing and situated in the aggregate of vaulted buildings surrounding Dzibilchaltun's central group, when compared with the small number of beam-and-mortar roofed "palaces" at Mayapan, indicates the diversity
of dwelling types as measured in terms of energy cost was larger at Dzibilchaltun than Mayapan. Even if most of what has been called the peripheral part of the mapped area at Dzibilchaltun is excluded from what is considered a single community, the population of Dzibilchaltun would be at least comparable with that of Mayapan, and probably larger. I can only conclude that the contrasts between Mayapan and Dzibilchaltun are not accurately represented by considering Mayapan urban and Dzibilchaltun a non-urban ceremonial center.

If urbanism is considered a process involving increased importance of a central place, one more point can be made for tendencies toward increased urbanism at Dzibilchaltun. The concentration of wealth and energy in the modification of the center of Dzibilchaltun through time suggest that the center of the site was becoming progressively more important than its peripheral areas. Increased nucleation then, seems to have been an important trend at late Classic Dzibilchaltun.

Summary of Conclusions

This study of prehistoric Maya architecture and community form indicates there was considerable variety in the patterns of Maya life present in a single large community. Differences in the form, size, consumption patterns, and social standing of the families that inhabited the site are inferred from contrasts in the form, size, and energy cost of residential structures. These data indicate the presence of the kind of social heterogeneity a student of community
structure would expect in an urban situation. The concentration of the most expensive buildings in time and space suggests that social differentiation became more pronounced during the late Classic Stage. The amount of material at the site dating from the late Classic Stage, when enumerated and contrasted with the amount of material culture dating from other periods in the history of Dzibilchaltun, indicates the population of the area reached a peak at the same time that these trends towards increased social differentiation and urbanism were taking place. These conclusions suggest several implications concerning the development of Maya society and social theory based on the interpretation of that development.

Implications

Archaeologists have been constantly accused of working in a theoretical vacuum. My review of the literature causes me to wonder if this accusation has ever been warranted, for Mayanists studying the problems examined here certainly presented their arguments in the context of social theory. Often the theoretical assumptions in their writings were not made explicit; but in this respect prehistorians differed little from other anthropologists. Because so many theoretical referents are found buried in the works of social scientists, a recent trend of clearly stating basic assumptions and carefully rethinking them seems to have developed in anthropology. Perhaps prehistorians should follow this procedure more often—even at the data collecting level of research.
Four important problems that have been constant themes in Mayan studies are outlined in Chapter II of this dissertation: The first of these is an interest in the size of Maya populations through time; the second is the question of the degree of social differentiation in prehistoric Maya society; the third is the question of urbanism in Maya society; and the fourth is the problem of the Classic Maya collapse. These four problems have been treated from numerous theoretical viewpoints. Positions taken by scholars on these topics have thus become an important referent to arguments in favor of various systems of social theory. The conclusions of this dissertation in terms of those four problems support many fundamental ideas concerning man and society.

The new data from Dzibilchaltun imply a stand on each of the four problems mentioned above. The data support those scholars who claim Mayan and Mesoamerican populations were relatively large. Urbanism and social differentiation I have argued, were both important at prehistoric Dzibilchaltun. These findings, as explained below, also have a bearing on the problem of the Maya collapse.

The subject of the Maya collapse is pertinent to one of the most interesting areas in the theory of social history—that concerning the manner in which societies fall apart or disintegrate. In spite of the large body of literature on this topic, it remains a very promising area for further research. A comparison of declining prehistoric civilizations from an anthropological perspective might
make a very significant contribution to this area of social theory. But outside the context of the Maya collapse, few prehistorians have devoted their energies to such problems. The reasons for this are probably inherent in anthropological theory.

The theoretical tools available to prehistorians seem far better suited to discussions of the development of civilizations rather than their decline. The doctrine of cultural relativity is very strong in American anthropology; anthropologists have delighted in showing that some of the most exotic human behavior can be considered adaptive and functional. Even mass human sacrifice has been so analyzed. But viewing data in this manner tends to obscure rather than elucidate factors that lead to the collapse of civilizations.

Examination of human behavior through determination of the function performed by such behavior for the social system as a whole is deeply ingrained in contemporary anthropology. Historically, students seem to have found it hard to search for the function of a behavior pattern without presupposing that the pattern does indeed benefit the social system. Several scholars have even shown how stresses and strains within a social system (such as social conflict) that could cause the decline of a civilization can actually function to preserve the system by leading to change. While this argument is well taken, it also illustrates the kind of social optimism characteristic of the functionalist approach. This
kind of thinking is a bias that becomes very apparent when one deals with the type of problem posed by the Maya collapse.

The manner in which functionalist thinkers have conceptualized systems also presents obstacles for the student who wishes to study the decline of civilizations. Most scholars insist that social systems are highly integrated; this assumption traditionally carries with it the implication that any factors tending to disrupt the system are external in their origin. Critics of the way in which functionalist theory has been used often point to the highly conservative and even panglossian attitudes fostered by these assumptions.

In spite of the weight of the ideas listed in the paragraphs above, anthropologists did formulate an explanation of the Maya collapse involving maladaptive directions in the evolution of that society. The explanation postulated internal strife between folk and urban components of Maya society and conflict between its social strata. But this theory stressing strife and conflict among the prehistoric Maya has been challenged on many levels by American scholars deeply influenced by classic functionalist thought.

There are four principal parts to the functionalist interpretation of Maya society and explanation of its collapse. First, the functionalists argue that the population of the Maya lowlands was relatively low. Second, a minimum of social differentiation is attributed to this society. Third, invasion by non-Maya peoples is considered the most important factor in the collapse. Fourth,
environmental limitations inherent in the tropical setting of the Maya civilization are viewed as possible contributing factors in the decline. These arguments and the evidence for them may be found in the writings of Willey and his collaborators (Willey 1956b, 1968; Bullard 1960, 1964; Willey and Bullard 1965; Willey and Sabloff 1967; cf. Willey and Shimkin 1971).

The conclusions of this dissertation conflict directly with the first two propositions. On the basis of the evidence from Dzibilchaltun, I believe that there was a larger population and more social differentiation in lowland Maya society than would Willey. Moreover, by implication the Dzibilchaltun data suggest folk-urban contrasts were characteristic of Maya society. Willey has argued that the Maya social system was more highly integrated than my interpretation of the Dzibilchaltun data would suggest.

There is little doubt that increased influence from central Mexico was a regular feature of the late Classic Stage in the Maya lowlands (cf. Ruz 1964b). There is even evidence of this at Dzibilchaltun (Andrews 1960). But I cannot understand the insistence of Sabloff and Willey (1967) on the primacy of invasion from central Mexico in setting into motion the process that led to the Maya collapse. After denying that Maya society had broken down internally prior to any invasion, these scholars argue that the stresses and strains within Maya society were so great that the slightest external impetus would have caused the collapse. I think their own arguments show that they were premature in suggesting that the case of the Maya
was an exception to Toynbee's position concerning the internal condition of civilizations that succumb to outside invasion. While I agree that there probably was an incursion and that it did contribute to the collapse, I believe other factors were much more important.

The conclusions of this dissertation indicate that there were several substantial changes in Maya society during the period before its decline. Considerable evidence for population growth and increased social differentiation during the late Classic Stage has been presented. These constituted internal changes that must have led to strains on the environment and social organization as well. These changes, as Willey and other Mayanists agree, must have been crucial factors leading to the collapse. Of course, constant interplay between all of these external and internal factors was probably more important than any single factor alone (cf. Willey and Shimkin 1971). But my inclination in seeking an explanation for the collapse of a society would be to concentrate on ecological factors suggested by Willey.

My review of the literature cites many studies of the relationship between Maya society and its environment. Recently such studies have been influenced by research in South America inspired by Julian Steward's "circum-Carribbean theory." Meggers and others have examined the breakdown of complex chiefdoms in the archaeological record of the South American tropical rainforests. The principal conclusion of her studies is that the special environmental limitations
on cultural development in tropical rainforests caused advanced societies to fall apart when introduced to such environments. Critics of Meggers' ideas compare her thinking with the largely discredited work of the diffusionists and environmental determinists who were important in anthropology during the early years of this century.

Even if the idea of environmental limitation is a legacy from environmental determinism, the concept remains an important one. It is unfortunate that the idea is almost exclusively applied to the tropics. Associated with the idea of environmental limitation is the erroneous proposition that tropical rainforests are unsuitable for the development and maintenance of civilized societies. Numerous civilizations in Africa, Asia, and the New World demonstrate that the tropics are a favorable climate for this kind of society. Of course, the previous statement commits the popular error of grouping all tropical environments together when in fact there are vast differences even between tropical rainforests. Thus I believe the constant search for special environmental limitations in tropical rainforests as a whole is not now a very useful anthropological activity. But the recent history of industrial societies in Europe and North America attests to the fact that no environment is without its limits. Environmental limitations to the growth of societies do exist.

The data from Dzibilchaltun clearly indicate a population peak during the late Classic stage. This evidence is consistent
with data from other areas of the lowlands; Willey (1964) often emphasizes this conclusion in his writings. Indeed Sabloff and Willey (1967) suggest that the population of the Maya lowlands was precariously balanced on the verge of overtaxing the environment.

The dynamics of population growth in human societies have been examined in considerable detail (cf. Birdsell 1957). In general population growth is rapid until the limits of the carrying capacity of the environment at a given level of technology are reached. After the growth rate levels, small peaks and nadirs in the curve of population growth represent minor adjustments to changes in the environment. These propositions from the area of population studies suggest the population growth curve in the Maya lowlands probably leveled off soon after the beginning of the late Classic.

The consequences of the kind of demographic situation thought to be characteristic of the late Classic are not usually conceived in terms of the highly integrated society envisioned by Willey. Even minor fluctuations in the weather of a kind that are common in the area today would under such demographic conditions cause increased competition for scarce resources. I consider the suggested demographic situation is sufficient justification to infer considerable conflict in Maya society. The structure of that conflict in what I consider a highly stratified social system is still a matter for speculation. But if social differentiation had indeed advanced as far as I believe the Dzibilchaltun data indicate, internal strife may well have been an important factor in the collapse of Maya civilization.
Two internal problems, then, are suggested as important factors in the Maya collapse: population growth that perhaps led to injudicious utilization of environmental resources resulting in ecological disaster and conflict between a ruling elite and an alienated populace. Both of these situations, of course, have their direct analogue in events that are taking place in the world today. Any study of the disintegration of ancient social systems would by implication support some current political positions. In the past, didactic approaches to social science have been disdained by some scholars in favor of less controversial studies in which greater pretensions of objectivity could be claimed.
<table>
<thead>
<tr>
<th>Phase</th>
<th>Characteristic Features</th>
</tr>
</thead>
</table>
| Colonial Period | |}

**Notes:**
1. The table above outlines chronological divisions in the prehistory of the Maya, follows the conventions of the *Olmec*.
<table>
<thead>
<tr>
<th>PHASE</th>
<th>NUMBER OF STRUCTURES CONTAINING POTTERY CHARACTERISTIC OF PHASE</th>
<th>PERCENTAGE OF STRUCTURES INVESTIGATED (N=392)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHECHEM</td>
<td>16</td>
<td>4%</td>
</tr>
<tr>
<td>HAAZ</td>
<td>11</td>
<td>37%</td>
</tr>
<tr>
<td>ZIPCHE</td>
<td>11</td>
<td>37%</td>
</tr>
<tr>
<td>COPO</td>
<td>355</td>
<td>92%</td>
</tr>
<tr>
<td>PIIM</td>
<td>16</td>
<td>4%</td>
</tr>
<tr>
<td>FORMATIVE - ALL PHASES (Mostly Chacah Phase)</td>
<td>103</td>
<td>26%</td>
</tr>
</tbody>
</table>

**TABLE 3.** Variety of unvaulted structures at Dzibilchaltun. This table shows the number of buildings in each of the categories listed above that are plotted on the map of Dzibilchaltun.
<table>
<thead>
<tr>
<th>STRUCTURE TYPE</th>
<th>FORMATIVE (ALL PHASES)</th>
<th>PIIM</th>
<th>COPO</th>
<th>ZIPCHE</th>
<th>HAAZ</th>
<th>CHECHEM</th>
<th>TOTAL STRUCTURES N=392</th>
</tr>
</thead>
<tbody>
<tr>
<td>APSIDAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SINGLE ROOM</td>
<td>25</td>
<td>2</td>
<td>148</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>153</td>
</tr>
<tr>
<td>RECTANGULAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SINGLE ROOM</td>
<td>15</td>
<td>4</td>
<td>49</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>52</td>
</tr>
<tr>
<td>RECTANGULAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MULTIROOM</td>
<td>7</td>
<td>1</td>
<td>33</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>34</td>
</tr>
<tr>
<td>PLATFORMS</td>
<td>56</td>
<td>9</td>
<td>125</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>153</td>
</tr>
<tr>
<td>TOTAL</td>
<td>103</td>
<td>16</td>
<td>355</td>
<td>11</td>
<td>11</td>
<td>16</td>
<td>392</td>
</tr>
</tbody>
</table>

TABLE 5. Unvaulted architecture dated by test-pitting in the mapped portion of Dzibilchaltun. The structures are listed by type. All of these structures contained either pottery from a single phase or in a few cases pottery from one phase predominating and a few sherds from another phase included in the sample taken from a small test excavation.

<table>
<thead>
<tr>
<th>STRUCTURE TYPE</th>
<th>CERAMIC PHASE</th>
<th>TOTAL STRUCTURES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FORMATIVE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PIIM</td>
<td>COPO</td>
</tr>
<tr>
<td>APSIDAL SINGLE ROOM</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>RECTANGULAR SINGLE ROOM</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>RECTANGULAR MULTIROOM</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>PLATFORMS</td>
<td>37</td>
<td>1</td>
</tr>
<tr>
<td>TOTALS</td>
<td>53</td>
<td>1</td>
</tr>
<tr>
<td>TYPE OF STRUCTURE</td>
<td>EXCAVATION</td>
<td>TEST-PITTING</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------</td>
<td>--------------</td>
</tr>
<tr>
<td>BLACK-ON-CREAM STRUCTURES</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>PURE FLORESCENT STRUCTURES</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>TRANSITIONAL STRUCTURES</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>EARLY PERIOD STRUCTURES</td>
<td>18</td>
<td>36</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>25</strong></td>
<td><strong>60</strong></td>
</tr>
</tbody>
</table>

TABLE 6. Kinds of investigations carried out at 240 vaulted structures located in the mapped area of Dzibilchaltun east of the Merida-Progresso Highway. This table indicates how many vaulted structures in each of the four categories listed above were investigated by complete excavation, test-pitting, surface-sampling, or architectural examination.
TABLE 7. Location, size, and substructure height of 150 Early Period vaulted buildings on the map of Dzibilchaltun. The coordinates are re-numbered in a grid system that has its origin 2,000 meters south and 5,000 meters west of the map sheet 000 000, the sheet on which Cenote Xclacah is located. The vault length is the total length of the vaulted rooms of the structure in meters; a zero in this column means that the vault length was not determined. The estimate of number of rooms present is often inaccurate due to the difficulty of locating interior partitions of unexcavated vaulted ruins. The substructure height is given in meters; a zero in this column means that the substructure was low, only a few centimeters high.
<table>
<thead>
<tr>
<th>INDEX NUMBER</th>
<th>NORTH COORDINATE</th>
<th>EAST COORDINATE</th>
<th>VAULT LENGTH</th>
<th>NUMBER OF ROOMS</th>
<th>SUBSTRUCTURE HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2019</td>
<td>6011</td>
<td>17</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>2809</td>
<td>6051</td>
<td>12</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>2747</td>
<td>6144</td>
<td>10</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>2443</td>
<td>6373</td>
<td>28</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>2439</td>
<td>6374</td>
<td>7</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>2624</td>
<td>6389</td>
<td>10</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>2625</td>
<td>6395</td>
<td>7</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>2284</td>
<td>6459</td>
<td>8</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>2617</td>
<td>6401</td>
<td>28</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>2476</td>
<td>6587</td>
<td>24</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>2490</td>
<td>6533</td>
<td>14</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>2490</td>
<td>6528</td>
<td>14</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>2514</td>
<td>6533</td>
<td>16</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>14</td>
<td>2514</td>
<td>6528</td>
<td>16</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>2515</td>
<td>6580</td>
<td>54</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>16</td>
<td>2535</td>
<td>6528</td>
<td>13</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>17</td>
<td>2535</td>
<td>6533</td>
<td>15</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>18</td>
<td>2552</td>
<td>6532</td>
<td>7</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>19</td>
<td>2570</td>
<td>6501</td>
<td>0</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>20</td>
<td>2515</td>
<td>6625</td>
<td>16</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>21</td>
<td>2602</td>
<td>6886</td>
<td>6.5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>22</td>
<td>2696</td>
<td>6856</td>
<td>18</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>23</td>
<td>2738</td>
<td>6862</td>
<td>16</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>24</td>
<td>2675</td>
<td>6945</td>
<td>15</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>25</td>
<td>2694</td>
<td>6983</td>
<td>7</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

TABLE 7. Location, size, and substructure height of 150 Early Period vaulted buildings on the map of Dzibilchaltun.
<table>
<thead>
<tr>
<th>INDEX NUMBER</th>
<th>NORTH COORDINATE</th>
<th>EAST COORDINATE</th>
<th>VAULT LENGTH</th>
<th>NUMBER OF ROOMS</th>
<th>SUBSTRUCTURE HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>2733</td>
<td>6941</td>
<td>7</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>27</td>
<td>2747</td>
<td>6955</td>
<td>48</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>28</td>
<td>2769</td>
<td>6967</td>
<td>26</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>29</td>
<td>2785</td>
<td>6969</td>
<td>26</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>30</td>
<td>2508</td>
<td>6020</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>31</td>
<td>2203</td>
<td>6510</td>
<td>22</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>32</td>
<td>2442</td>
<td>6906</td>
<td>15</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>33</td>
<td>2443</td>
<td>6970</td>
<td>19</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>34</td>
<td>2337</td>
<td>5570</td>
<td>10</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>35</td>
<td>2181</td>
<td>5730</td>
<td>18</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>36</td>
<td>2111</td>
<td>5810</td>
<td>18</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>37</td>
<td>2235</td>
<td>5935</td>
<td>26</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>38</td>
<td>2275</td>
<td>5919</td>
<td>17</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>39</td>
<td>2540</td>
<td>5515</td>
<td>46</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>40</td>
<td>2514</td>
<td>5888</td>
<td>30</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>41</td>
<td>2538</td>
<td>5862</td>
<td>6</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>42</td>
<td>2380</td>
<td>5680</td>
<td>208</td>
<td>22</td>
<td>2</td>
</tr>
<tr>
<td>43</td>
<td>2528</td>
<td>5848</td>
<td>19</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>44</td>
<td>2537</td>
<td>5836</td>
<td>13</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>45</td>
<td>2244</td>
<td>5585</td>
<td>14</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>46</td>
<td>2290</td>
<td>5585</td>
<td>24</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>47</td>
<td>2551</td>
<td>5539</td>
<td>14</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>48</td>
<td>2345</td>
<td>5663</td>
<td>37</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>49</td>
<td>2347</td>
<td>5600</td>
<td>24</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>2354</td>
<td>5644</td>
<td>17</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

TABLE 7 (continued)
<table>
<thead>
<tr>
<th>INDEX NUMBER</th>
<th>NORTH COORDINATE</th>
<th>EAST COORDINATE</th>
<th>VAULT LENGTH</th>
<th>NUMBER OF ROOMS</th>
<th>SUBSTRUCTURE HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>2615</td>
<td>5698</td>
<td>23</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>52</td>
<td>2010</td>
<td>5790</td>
<td>18</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>53</td>
<td>2250</td>
<td>5707</td>
<td>16</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>54</td>
<td>2405</td>
<td>5717</td>
<td>15</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>55</td>
<td>2687</td>
<td>5702</td>
<td>20</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>56</td>
<td>2661</td>
<td>5724</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>57</td>
<td>2700</td>
<td>5736</td>
<td>19</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>58</td>
<td>2708</td>
<td>5745</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>59</td>
<td>2727</td>
<td>5707</td>
<td>27</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>60</td>
<td>2218</td>
<td>5818</td>
<td>18</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>61</td>
<td>2318</td>
<td>5842</td>
<td>16</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>62</td>
<td>2385</td>
<td>5860</td>
<td>118</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>63</td>
<td>2464</td>
<td>5806</td>
<td>11</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>64</td>
<td>2480</td>
<td>5815</td>
<td>18</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>65</td>
<td>2144</td>
<td>5920</td>
<td>16</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>66</td>
<td>2402</td>
<td>5939</td>
<td>16</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>67</td>
<td>2425</td>
<td>5940</td>
<td>16</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>68</td>
<td>2449</td>
<td>5940</td>
<td>17</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>69</td>
<td>2472</td>
<td>5956</td>
<td>18</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>70</td>
<td>2560</td>
<td>5598</td>
<td>17</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>71</td>
<td>2374</td>
<td>5018</td>
<td>16</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>72</td>
<td>2562</td>
<td>5045</td>
<td>26</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>73</td>
<td>2570</td>
<td>5087</td>
<td>14</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>74</td>
<td>2752</td>
<td>5005</td>
<td>11</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>75</td>
<td>2566</td>
<td>5194</td>
<td>17</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

TABLE 7 (continued)
<table>
<thead>
<tr>
<th>INDEX NUMBER</th>
<th>NORTH COORDINATE</th>
<th>EAST COORDINATE</th>
<th>VAULT LENGTH</th>
<th>NUMBER OF ROOMS</th>
<th>SUBSTRUCTURE HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>76</td>
<td>2667</td>
<td>5129</td>
<td>13</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>77</td>
<td>2720</td>
<td>5180</td>
<td>30</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>78</td>
<td>2228</td>
<td>5362</td>
<td>13</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>79</td>
<td>2235</td>
<td>5372</td>
<td>29</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>80</td>
<td>2249</td>
<td>5345</td>
<td>21</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>81</td>
<td>2321</td>
<td>5386</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>82</td>
<td>2655</td>
<td>5315</td>
<td>20</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>83</td>
<td>2247</td>
<td>5415</td>
<td>13</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>84</td>
<td>2267</td>
<td>5437</td>
<td>0</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>85</td>
<td>2288</td>
<td>5476</td>
<td>10</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>86</td>
<td>2307</td>
<td>5424</td>
<td>11</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>87</td>
<td>2361</td>
<td>5421</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>88</td>
<td>2373</td>
<td>5415</td>
<td>19</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>89</td>
<td>2760</td>
<td>5415</td>
<td>16</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>90</td>
<td>2838</td>
<td>4154</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>91</td>
<td>2872</td>
<td>4112</td>
<td>18</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>92</td>
<td>2663</td>
<td>4258</td>
<td>18</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>93</td>
<td>2169</td>
<td>4410</td>
<td>22</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>94</td>
<td>2737</td>
<td>4943</td>
<td>20</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>95</td>
<td>2825</td>
<td>4132</td>
<td>17</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>96</td>
<td>2847</td>
<td>4118</td>
<td>19</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>97</td>
<td>2874</td>
<td>4127</td>
<td>12</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>98</td>
<td>2494</td>
<td>4390</td>
<td>16</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>99</td>
<td>2160</td>
<td>4479</td>
<td>15</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>100</td>
<td>2164</td>
<td>4454</td>
<td>7</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

TABLE 7 (continued)
<table>
<thead>
<tr>
<th>INDEX NUMBER</th>
<th>NORTH COORDINATE</th>
<th>EAST COORDINATE</th>
<th>VAULT LENGTH</th>
<th>NUMBER OF ROOMS</th>
<th>SUBSTRUCTURE HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>2175</td>
<td>4423</td>
<td>23</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>102</td>
<td>2481</td>
<td>4420</td>
<td>21</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>103</td>
<td>2506</td>
<td>4420</td>
<td>21</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>104</td>
<td>2361</td>
<td>4508</td>
<td>11</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>105</td>
<td>2806</td>
<td>4524</td>
<td>13</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>106</td>
<td>2538</td>
<td>4727</td>
<td>7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>107</td>
<td>2301</td>
<td>4955</td>
<td>10</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>108</td>
<td>2266</td>
<td>3216</td>
<td>35</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>109</td>
<td>2927</td>
<td>3600</td>
<td>12</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>110</td>
<td>2250</td>
<td>3216</td>
<td>12</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>111</td>
<td>2905</td>
<td>3554</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>112</td>
<td>2055</td>
<td>2642</td>
<td>20</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>113</td>
<td>2802</td>
<td>7247</td>
<td>19</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>114</td>
<td>2836</td>
<td>7318</td>
<td>18</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>115</td>
<td>2851</td>
<td>7313</td>
<td>8</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>116</td>
<td>2259</td>
<td>7457</td>
<td>12</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>117</td>
<td>2287</td>
<td>7476</td>
<td>7</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>118</td>
<td>2447</td>
<td>7051</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>119</td>
<td>2453</td>
<td>7005</td>
<td>12</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>120</td>
<td>2668</td>
<td>7021</td>
<td>0</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>121</td>
<td>2648</td>
<td>7297</td>
<td>14</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>122</td>
<td>2849</td>
<td>7304</td>
<td>6</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>123</td>
<td>1110</td>
<td>8120</td>
<td>14</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>124</td>
<td>1103</td>
<td>8185</td>
<td>22</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>125</td>
<td>1762</td>
<td>7034</td>
<td>15</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

TABLE 7 (continued)
<table>
<thead>
<tr>
<th>INDEX NUMBER</th>
<th>NORTH COORDINATE</th>
<th>EAST COORDINATE</th>
<th>VAULT LENGTH</th>
<th>NUMBER OF ROOMS</th>
<th>SUBSTRUCUTURE HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>126</td>
<td>1047</td>
<td>7884</td>
<td>7.5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>127</td>
<td>1056</td>
<td>7880</td>
<td>9.5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>128</td>
<td>1066</td>
<td>7888</td>
<td>14</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>129</td>
<td>1091</td>
<td>7893</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>130</td>
<td>1072</td>
<td>7913</td>
<td>10</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>131</td>
<td>1083</td>
<td>7885</td>
<td>28</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>132</td>
<td>1357</td>
<td>6384</td>
<td>16</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>133</td>
<td>1746</td>
<td>6868</td>
<td>15</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>134</td>
<td>1975</td>
<td>5600</td>
<td>6</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>135</td>
<td>1321</td>
<td>5818</td>
<td>11</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>136</td>
<td>1751</td>
<td>5125</td>
<td>16</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>137</td>
<td>1500</td>
<td>5766</td>
<td>8</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>138</td>
<td>1937</td>
<td>5742</td>
<td>12</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>139</td>
<td>1216</td>
<td>4230</td>
<td>20</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>140</td>
<td>1222</td>
<td>3479</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>141</td>
<td>3267</td>
<td>6029</td>
<td>13</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>142</td>
<td>3275</td>
<td>4499</td>
<td>18</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>143</td>
<td>3731</td>
<td>4068</td>
<td>8</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>144</td>
<td>3749</td>
<td>4076</td>
<td>12</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>145</td>
<td>3755</td>
<td>4066</td>
<td>6</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>146</td>
<td>3769</td>
<td>4065</td>
<td>30</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>147</td>
<td>3883</td>
<td>2372</td>
<td>13</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>148</td>
<td>3891</td>
<td>2403</td>
<td>12</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>149</td>
<td>3385</td>
<td>2817</td>
<td>11</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>150</td>
<td>3689</td>
<td>2931</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

TABLE 7 (continued).
TABLE 8. Location, size, and substructure height of 14 Transitional Early Period - Pure Florescent vaulted buildings on the map of Dzibilchaltun. The coordinates are re-numbered in a grid system that has its origin 2,000 meters south and 5,000 meters west of the map sheet J 000 O 000, the sheet on which Cenote Xclacah is located. The vault length is the total length of the vaulted rooms of the structure in meters; a zero in this column means that the vault length was not determined. The estimate of number of rooms present is often inaccurate due to the difficulty of locating interior partitions of unexcavated vaulted ruins. The substructure height is given in meters; a zero in this column means that the substructure was low, only a few centimeters high.
<table>
<thead>
<tr>
<th>INDEX NUMBER</th>
<th>NORTH COORDINATE</th>
<th>EAST COORDINATE</th>
<th>VAULT LENGTH</th>
<th>NUMBER OF ROOMS</th>
<th>SUBSTRUCTURE HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2445</td>
<td>6963</td>
<td>22</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>2501</td>
<td>6993</td>
<td>22</td>
<td>4</td>
<td>2.5</td>
</tr>
<tr>
<td>3</td>
<td>2200</td>
<td>5805</td>
<td>36</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>2336</td>
<td>5643</td>
<td>46</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>2366</td>
<td>5649</td>
<td>11</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>2377</td>
<td>5617</td>
<td>22</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>2177</td>
<td>5953</td>
<td>7</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>2198</td>
<td>5949</td>
<td>8</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>2216</td>
<td>5390</td>
<td>31</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>1540</td>
<td>5676</td>
<td>33</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>1452</td>
<td>5755</td>
<td>21</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>1898</td>
<td>4938</td>
<td>12.5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>3876</td>
<td>2380</td>
<td>8</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>14</td>
<td>3930</td>
<td>2363</td>
<td>16</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

TABLE 8. Location, size, and substructure height of 14 Transitional Early Period - Pure Florescent vaulted buildings on the map of Dzibilchaltun.
TABLE 9. Location, size, and substructure height of 73 Pure Florescent vaulted buildings on the map of Dzibilchaltun. The coordinates are re-numbered in a grid system that has its origin 2,000 meters south and 5,000 meters west of the map sheet J 000 o 000, the sheet on which Cenote Xclacah is located. The vault length is the total length of the vaulted rooms of the structure in meters; a zero in this column means that the vault length was not determined. The estimate of number of rooms present is often inaccurate due to the difficulty of locating interior partitions of unexcavated vaulted ruins. The substructure height is given in meters; a zero in this column means that the substructure was low, only a few centimeters high.
<table>
<thead>
<tr>
<th>INDEX NUMBER</th>
<th>NORTH COORDINATE</th>
<th>EAST COORDINATE</th>
<th>VAULT LENGTH</th>
<th>NUMBER OF ROOMS</th>
<th>SUBSTRUCTURE HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2435</td>
<td>6038</td>
<td>8</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>2634</td>
<td>6239</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>2646</td>
<td>6256</td>
<td>8</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>2181</td>
<td>6305</td>
<td>26</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>2230</td>
<td>5785</td>
<td>18</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>2180</td>
<td>5890</td>
<td>25</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>2240</td>
<td>5842</td>
<td>12</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>2190</td>
<td>5915</td>
<td>12</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>2210</td>
<td>5908</td>
<td>16</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>2270</td>
<td>5755</td>
<td>16</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>2271</td>
<td>5735</td>
<td>14</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>2273</td>
<td>5715</td>
<td>22</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>2549</td>
<td>5845</td>
<td>21</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>2177</td>
<td>5565</td>
<td>44</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>2294</td>
<td>5645</td>
<td>50</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>16</td>
<td>2310</td>
<td>5611</td>
<td>29</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>17</td>
<td>2311</td>
<td>5636</td>
<td>24</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>18</td>
<td>2326</td>
<td>5627</td>
<td>17</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>19</td>
<td>2436</td>
<td>5618</td>
<td>10</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>20</td>
<td>2206</td>
<td>5749</td>
<td>8</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>21</td>
<td>2249</td>
<td>5750</td>
<td>16</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td>2250</td>
<td>5795</td>
<td>42</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>23</td>
<td>2261</td>
<td>5781</td>
<td>14</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>24</td>
<td>2630</td>
<td>5735</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>25</td>
<td>2671</td>
<td>5743</td>
<td>17</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

TABLE 9. Location, size, and substructure height of 73 Pure Florescent vaulted buildings on the map of Dzibilchaltun.
<table>
<thead>
<tr>
<th>INDEX NUMBER</th>
<th>NORTH COORDINATE</th>
<th>EAST COORDINATE</th>
<th>VAULT LENGTH</th>
<th>NUMBER OF ROOMS</th>
<th>SUBSTRUCTURE HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>2220</td>
<td>5873</td>
<td>21</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>27</td>
<td>2325</td>
<td>5805</td>
<td>18</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>28</td>
<td>2747</td>
<td>5885</td>
<td>23</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>29</td>
<td>2750</td>
<td>5902</td>
<td>23</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>30</td>
<td>2159</td>
<td>5911</td>
<td>28</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>31</td>
<td>2169</td>
<td>5940</td>
<td>8</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>32</td>
<td>2794</td>
<td>5938</td>
<td>7</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>33</td>
<td>2560</td>
<td>5688</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>34</td>
<td>2210</td>
<td>5730</td>
<td>34</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>35</td>
<td>2001</td>
<td>5734</td>
<td>12</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>36</td>
<td>2699</td>
<td>5153</td>
<td>24</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>37</td>
<td>2348</td>
<td>5277</td>
<td>21</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>38</td>
<td>2985</td>
<td>5296</td>
<td>10</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>39</td>
<td>2168</td>
<td>5398</td>
<td>22</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>40</td>
<td>2253</td>
<td>5399</td>
<td>18</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>41</td>
<td>2265</td>
<td>5323</td>
<td>26</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>42</td>
<td>2290</td>
<td>5327</td>
<td>23</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>43</td>
<td>2310</td>
<td>5330</td>
<td>24</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>44</td>
<td>2188</td>
<td>5423</td>
<td>18</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>45</td>
<td>2192</td>
<td>5447</td>
<td>12</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>46</td>
<td>2321</td>
<td>5408</td>
<td>36</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>47</td>
<td>2390</td>
<td>5418</td>
<td>14</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>48</td>
<td>2668</td>
<td>5492</td>
<td>19</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>49</td>
<td>2063</td>
<td>5493</td>
<td>16</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>2180</td>
<td>4475</td>
<td>42</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

TABLE 9 (continued)
<table>
<thead>
<tr>
<th>INDEX NUMBER</th>
<th>NORTH COORDINATE</th>
<th>EAST COORDINATE</th>
<th>VAULT LENGTH</th>
<th>NUMBER OF ROOMS</th>
<th>SUBSTRUCTURE HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>2273</td>
<td>7438</td>
<td>32</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>52</td>
<td>1053</td>
<td>7906</td>
<td>10</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>53</td>
<td>1398</td>
<td>6225</td>
<td>21</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>54</td>
<td>1422</td>
<td>6253</td>
<td>36</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>55</td>
<td>1062</td>
<td>2515</td>
<td>12</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>56</td>
<td>1399</td>
<td>5592</td>
<td>16</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>57</td>
<td>1919</td>
<td>5525</td>
<td>19</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>58</td>
<td>1431</td>
<td>5655</td>
<td>36</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>59</td>
<td>1479</td>
<td>5635</td>
<td>32</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>60</td>
<td>1486</td>
<td>5660</td>
<td>20</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>61</td>
<td>1510</td>
<td>5637</td>
<td>26</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>62</td>
<td>1526</td>
<td>5621</td>
<td>18</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>63</td>
<td>1480</td>
<td>5802</td>
<td>21</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>64</td>
<td>1842</td>
<td>5820</td>
<td>37</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>65</td>
<td>1702</td>
<td>5348</td>
<td>15</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>66</td>
<td>1259</td>
<td>5452</td>
<td>15</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>67</td>
<td>1938</td>
<td>5522</td>
<td>17</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>68</td>
<td>1950</td>
<td>5575</td>
<td>16</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>69</td>
<td>1980</td>
<td>5558</td>
<td>44</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>70</td>
<td>1440</td>
<td>5630</td>
<td>19</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>71</td>
<td>1412</td>
<td>5730</td>
<td>8</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>72</td>
<td>3141</td>
<td>5760</td>
<td>12</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>73</td>
<td>3750</td>
<td>4036</td>
<td>27</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

TABLE 9 (continued).
<table>
<thead>
<tr>
<th>INDEX NUMBER</th>
<th>NORTH COORDINATE</th>
<th>EAST COORDINATE</th>
<th>VAULT LENGTH</th>
<th>NUMBER OF ROOMS</th>
<th>SUBSTRUCTURE HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2025</td>
<td>5717</td>
<td>20</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>2500</td>
<td>5927</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>2508</td>
<td>5905</td>
<td>8</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

TABLE 10. Location, size, and substructure height of 3 Black-on-Cream vaulted buildings on the map of Dzibilchaltun. The coordinates are renumbered in a grid system that has its origin 2,000 meters south and 5,000 meters west of the map sheet J 000 o 000, the sheet on which Cenote Xclacah is located. The vault length is the total length of the vaulted rooms of the structure in meters; a zero in this column means that the vault length was not determined. The estimate of number of rooms present is often inaccurate due to the difficulty of locating interior partitions of unexcavated vaulted ruins. The substructure height is given in meters; a zero in this column means that the substructure was low, only a few centimeters high.
<table>
<thead>
<tr>
<th></th>
<th>EARLY PERIOD</th>
<th>TRANSITIONAL</th>
<th>PURE FLORESCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ESTIMATED NUMBER OF ROOMS PER STRUCTURE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MAXIMUM</strong></td>
<td>22</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td><strong>MINIMUM</strong></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>MEAN</strong></td>
<td>2.2</td>
<td>2.6</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>STANDARD DEVIATION</strong></td>
<td>2.0</td>
<td>1.5</td>
<td>1.7</td>
</tr>
<tr>
<td><strong>MEDIAN</strong></td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>MODE</strong></td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

| **ESTIMATED VAULT LENGTH PER STRUCTURE IN METERS** |              |              |                 |
| **MAXIMUM**           | 208          | 46           | 72              |
| **MINIMUM**           | 4            | 7            | 7               |
| **MEAN**              | 18.3         | 21.1         | 21.8            |
| **STANDARD DEVIATION**| 19.7         | 11.9         | 11.6            |
| **MEDIAN**            | 16           | 21.5         | 19              |
| **MODE**              | 16           | 22           | 16              |

**TABLE 11.** Comparison of the sizes of Early Period Phase II, Transitional Early Period-Pure Florescent, and Pure Florescent vaulted structures at Dzibilchaltun.
<table>
<thead>
<tr>
<th>SIZE OF THE COMPLEXES</th>
<th>NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWO STRUCTURES ON A PLATFORM</td>
<td>53</td>
</tr>
<tr>
<td>TWO STRUCTURES ON A PLATFORM LARGE ENOUGH TO SUPPORT OTHER STRUCTURES</td>
<td>77</td>
</tr>
<tr>
<td>THREE STRUCTURES ON A PLATFORM</td>
<td>20</td>
</tr>
<tr>
<td>THREE STRUCTURES ON A PLATFORM LARGE ENOUGH TO SUPPORT OTHER STRUCTURES</td>
<td>44</td>
</tr>
<tr>
<td>FOUR STRUCTURES ON A PLATFORM</td>
<td>14</td>
</tr>
<tr>
<td>FOUR STRUCTURES ON A PLATFORM LARGE ENOUGH TO SUPPORT OTHER STRUCTURES</td>
<td>10</td>
</tr>
<tr>
<td>FIVE STRUCTURES ON A PLATFORM</td>
<td>5</td>
</tr>
<tr>
<td>FIVE STRUCTURES ON A PLATFORM LARGE ENOUGH TO SUPPORT OTHER STRUCTURES</td>
<td>15</td>
</tr>
<tr>
<td>SIX STRUCTURES ON A PLATFORM</td>
<td>6</td>
</tr>
<tr>
<td>SIX STRUCTURES ON A PLATFORM LARGE ENOUGH TO SUPPORT OTHER STRUCTURES</td>
<td>2</td>
</tr>
<tr>
<td>SEVEN STRUCTURES ON A PLATFORM</td>
<td>1</td>
</tr>
<tr>
<td>SEVEN STRUCTURES ON A PLATFORM LARGE ENOUGH TO SUPPORT OTHER STRUCTURES</td>
<td>3</td>
</tr>
<tr>
<td>EIGHT STRUCTURES ON A PLATFORM</td>
<td>1</td>
</tr>
<tr>
<td>EIGHT STRUCTURES ON A PLATFORM LARGE ENOUGH TO SUPPORT OTHER STRUCTURES</td>
<td>4</td>
</tr>
<tr>
<td>NINE STRUCTURES ON A PLATFORM</td>
<td>1</td>
</tr>
<tr>
<td>NINE STRUCTURES ON A PLATFORM LARGE ENOUGH TO SUPPORT OTHER STRUCTURES</td>
<td>1</td>
</tr>
<tr>
<td>TEN STRUCTURES ON A PLATFORM LARGE ENOUGH TO SUPPORT OTHER STRUCTURES</td>
<td>1</td>
</tr>
<tr>
<td>TWELVE STRUCTURES ON A PLATFORM</td>
<td>1</td>
</tr>
<tr>
<td>FIFTEEN STRUCTURES ON A PLATFORM LARGE ENOUGH TO SUPPORT OTHER STRUCTURES</td>
<td>1</td>
</tr>
<tr>
<td>SIXTEEN STRUCTURES ON A PLATFORM</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL PLATFORM OR TERRACE COMPLEX</td>
<td>261</td>
</tr>
</tbody>
</table>

**TABLE 12.** The sizes of 261 platform or terrace complexes on the map of Dzibilchaltun. (The table does not include those terraces in the central part of the site that are connected by raised causeways or sacbeob.)
TABLE 13. Comparison of the distances of late Classic vaulted structures from the centroids of Early Period, Transitional, and Pure Florescent vaulted buildings. The centroids of each category are the simple average of the coordinates of the buildings in that category. The distance from that point to each building in the category was measured. The mean, median, and standard deviation of the frequency distribution of the distances for each category are reported above.

<table>
<thead>
<tr>
<th></th>
<th>EARLY PERIOD</th>
<th>TRANSITIONAL</th>
<th>PURE FLORESCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUMBER OF BUILDINGS</td>
<td>150</td>
<td>14</td>
<td>73</td>
</tr>
<tr>
<td>CENTROID</td>
<td>J4350700</td>
<td>J3940362</td>
<td>J1650664</td>
</tr>
<tr>
<td>DISTRIBUTION OF THE STRUCTURES FROM THEIR RESPECTIVE CENTROIDS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEAN DISTANCE (in meters)</td>
<td>1,053</td>
<td>1,090</td>
<td>543</td>
</tr>
<tr>
<td>MEDIAN DISTANCE (in meters)</td>
<td>838</td>
<td>641</td>
<td>359</td>
</tr>
<tr>
<td>STANDARD DEVIATION (in meters)</td>
<td>831</td>
<td>1,060</td>
<td>553</td>
</tr>
<tr>
<td></td>
<td>EARLY PERIOD</td>
<td>TRANSITIONAL</td>
<td>PURE FLORESCENT</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------</td>
<td>--------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>NUMBER OF BUILDINGS</td>
<td>150</td>
<td>14</td>
<td>73</td>
</tr>
<tr>
<td>DISTANCE OF STRUCTURES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IN METERS FROM J349o671</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEAN DISTANCE</td>
<td>1048</td>
<td>981</td>
<td>545</td>
</tr>
<tr>
<td>MEDIAN DISTANCE</td>
<td>860</td>
<td>550</td>
<td>362</td>
</tr>
<tr>
<td>STANDARD DEVIATION</td>
<td>827</td>
<td>1219</td>
<td>573</td>
</tr>
</tbody>
</table>

**TABLE 14.** Comparisons of the distance from the weighted centroid of all late Classic vaulted architecture, J324o687, to Early Period, Pure Florescent, and Transitional vaulted buildings. The weighted centroid is found by multiplying each coordinate of a vaulted building by the vault length of that building. The sum of these quotients for the 237 late Classic vaulted structures at the site are then divided by the sum of the vault lengths. The distance from each building to the weighted centroid is then measured. The mean, median, and standard deviation of the frequency distribution of the distances for each category are reported above.
TABLE 15. Comparison of the percentage of Early Period and Pure Florescent vaulted architecture located within various distances from their respective centroids. The total amount of Pure Florescent architecture is estimated at 1,584 meters of vaulted corridors while the total length of the Early Period vaults exceeds 2,730 meters. The first figures in the table indicate that 41% of the Pure Florescent architecture is within 250 meters of the centroid of Pure Florescent vaulted buildings, J1650664. The centroid of the Early Period vaulted structures is located at J4350700. The centroids are determined by averaging the coordinates of the buildings.

<table>
<thead>
<tr>
<th>Distance in Meters from Centroids</th>
<th>250</th>
<th>500</th>
<th>750</th>
<th>1000</th>
<th>1250</th>
<th>1500</th>
<th>1750</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of Pure Florescent Architecture Located Within the Distance Indicated</td>
<td>41%</td>
<td>63%</td>
<td>84%</td>
<td>92%</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
<td>97%</td>
</tr>
<tr>
<td>Percentage of Early Period Architecture Located Within the Distance Indicated</td>
<td>30%</td>
<td>44%</td>
<td>52%</td>
<td>64%</td>
<td>68%</td>
<td>82%</td>
<td>87%</td>
<td>89%</td>
</tr>
</tbody>
</table>
Figure 1. Map of the Maya region. The major sites and geographical features in the region are located in this plate.
Figure 2. Aerial view of the archaeological zone of Dzibilchaltun. The mapped area at Dzibilchaltun is enclosed with a thin black line. The road that diagonally bisects the photograph on the left side of the page is the Merida-Progresso Highway. The long axial sacbe and the central group are clearly visible in the center of the photograph. The sacbe is white where it has been cleared and appears dark where it traverses henequen fields. The thin white lines that divide cultivated areas are access roads and stone walls. The photograph was taken by Cia. Mexicana de Aerophoto in December of 1969 at about 9:00 A.M. The scale of the photograph can be estimated by the length of the axial sacbe that reaches from the Temple of the Seven Dolls to Cenote Xclacah and on into the henequen fields to the west, a distance of about 2 kilometers. The edge of the photograph closest to the binding is the north side.

A. The road to Ko'oxchen. B. Hacienda X-cunatun. C. The village of Chablekal. D. Hacienda Dzibilchaltun. E. Cenote Xclacah. F. Temple of the Seven Dolls. G. The Structure 605 group is about 500 meters west of this location. H. The Structure 425 group.
Figure 3. Distribution of structures on the map of Dzibilchaltun where evidence of construction or occupation during any of the Formative phases was encountered. Each circle represents the location of a structure surveyed by complete excavation, test pitting, surface sampling, or architectural examination. The circles shaded solid black show which of the investigated structures yielded evidence of construction or occupation during any Formative phase. The shaded circles mark the location of all structures where Chacah or Xan pottery was collected. The heavy concentrations of Formative structures west of the Merida-Progresso highway are not shown on this map. Most of the solid black circles represent Middle Formative structures. Unshaded circles represent investigated structures where Formative material was not found.
Figure 4. Distribution of structures on the map of Dzibilchaltun where evidence of construction or occupation during Early Period Phase I was encountered. Each circle represents the location of a structure surveyed by complete excavation, test pitting, surface sampling, or architectural investigation. The circles shaded solid black show which of the investigated structures yielded evidence of construction or use during Early Period Phase I. These would include only structures where Piim pottery was collected. Unshaded circles represent investigated structures where Piim pottery was not found. Note that the number of shaded circles is considerably smaller than on the map showing the distribution of Formative structures, or on the map showing the distribution of Early Period II and Pure Florescent phase structures.
Figure 5. Distribution of structures on the map of Dzibilchaltun where evidence of construction or occupation during the Early Period II and Pure Florescent phases was encountered. Each circle represents the location of a structure surveyed by complete excavation, test pitting, surface sampling, or architectural examination. The circles shaded solid black show which of the investigated structures yielded evidence of construction or use during the Early Period II or Pure Florescent phases. The shaded circles mark the positions of all Early Period, Transitional, and Pure Florescent vaulted buildings as well as all unvaulted structures where Copo pottery was collected. Unshaded circles represent investigated structures where Early Period II or Pure Florescent material was not found. Most of the architecture on the map of Dzibilchaltun dates from the "late Classic" component in the site's history. This conclusion, the most important finding of the test pitting operations, is illustrated by this figure.
Figure 6. Distribution of structures on the map of Dzibilchaltun where evidence of construction or occupation during the Modified Florescent Phase was encountered. Each circle represents the location of a structure surveyed by complete excavation, test pitting, surface sampling, or architectural examination. Circles shaded solid black show which of the investigated structures yielded evidence of use or occupation during the Modified Florescent Phase. The shaded circles include only those buildings where Zipche pottery was collected. Unshaded circles mark the positions of investigated structures where Zipche pottery was not found.
Figure 7. Distribution of structures on the map of Dzibilchaltun where evidence of construction or occupation during the Black-on-Cream Transition was encountered. Each circle represents the location of a structure surveyed by complete excavation, test pitting, surface sampling, or architectural examination. Circles shaded solid black show which of the investigated structures yielded evidence of use or occupation during the Black-on-Cream Transition. These shaded circles mark buildings where Haaz pottery was collected. Unshaded circles represent investigated structures where Haaz pottery was not found.
Figure 8. Distribution of structures on the map of Dzibilchaltun where evidence of construction or occupation during the Decadent Phases was encountered. Each circle represents the location of a structure surveyed by complete excavation, test pitting, surface sampling, or architectural examination. Circles shaded solid black show which of the investigated structures yielded evidence of use or occupation during the Decadent Phases. These shaded circles mark buildings where Chechem pottery was collected. Unshaded circles represent investigated structures where Chechem pottery was not found.
Figure 9. Structure 3721 (K737m645), an apsidal unvaulted building situated on a low platform. The superstructure itself measures 2.5 meters long and 3.6 meters wide. The door jambs are directly in front of the worker. The jamb to the worker's right had fallen forward; it had been raised into place for this photograph. The right jamb had broken into two pieces. The top piece was fitted to the lower part for the photograph. The lower part remained in situ. Behind the worker is the tomb encountered when the structure was test pitted: the slabs that covered the tomb are laying turned over on the side of the tomb to the worker's right. Apart from clearing away the bush and placing a small test pit in the center of the building, the structure was photographed as it was found. The camera faces east. See Figure 10. Photo taken in April, 1963.
Figure 10. Another view of structure 3721, an apsidal unvaulted building erected on a low platform. All of the substructure is visible. One of the workers (upper right) is on the southwest corner of the substructure; the row of slabs in front of him is the west retaining wall. Note the amount of debris present; it is sufficient to carry the masonry foundation of the superstructure no more than about a meter high. Much of the walls of the building must have been of wattle-and-daub, as is the custom in the construction of this kind of building in the area today. Very little moving of stones or excavation around the walls was done; the ruin is almost exactly as it was found. The camera faces south. Photo taken in April, 1963.
Figure 11. Structure 3605 (I615q003), an apsidal unvaulted building erected on a low platform. The superstructure itself measures 6.3 meters long and 4.3 meters wide. One worker, at the upper right side of the photo, is standing on the northeast corner of the platform. The slabs of the south retaining wall, fallen from their original place, are partly visible at the bottom of the photograph. The worker at the upper left of the photograph is standing in the doorway; both jambs were found in place. The camera faces north. Photo taken in April, 1963.
Figure 12. Structure 3610 (I695p890), an apsidal unvaulted building erected on a very low platform (?). The structure is 6.1 meters long and 4.0 meters wide. The two standing jambs (on the right side of the photo) are about a meter high. Note the amount of debris present; the walls of the structure above the surviving masonry foundation were probably of perishable materials. The camera faces southwest. Photo taken in April, 1963
Figure 13. Stone-by-stone groundplan of structure 736 (J597p876), an apsidal unvaulted building erected on the ground surface rather than any kind of platform. The jamb stone on the north side of the doorway was the largest block used in the structure; it was about 1 meter high.
Figure 13. Stone-by-stone groundplan of structure 736 (J597p876), an apsidal unvaulted building erected on the ground surface.
Figure 14. Ground plan of structure 777 (J785p939), a single-roomed rectangular unvaulted building situated on a large low platform.
Figure 14. Groundplan of structure 777 (J78p939), a single-roomed rectangular unvaulted building on a large low platform.
Figure 15. Ground plan of Structure 730 (J693829), a single-roomed rectangular unvaulted building situated on a low platform.
Figure 15. Groundplan of structure 730 (1692p829), a single-roomed rectangular unvaulted building situated on a low platform.
Figure 16. Ground plan of structure 722 (J542p745), a multi-roomed rectangular unvaulted building, situated on a large low platform. This isometric drawing shows the existing masonry. The walls of the structure, 15.1 meters long and 3.5 meters wide, were entirely of masonry, judging from the amount of debris present. Re-used Pure Florescent wall stones and the presence of Copo pottery indicate that the structure was built during the Pure Florescent Phase. Drawing by John C. Scheffler.
Figure 17. Comparison of the sizes of Early Period and Pure Florescent Vaulted Buildings. The histograms in this Figure show the percentage of buildings from each period having vault lengths corresponding to the classes above. Histograms marked with asterisks show the distribution of the lengths of Pure Florescent vaulted structures while small circles show the distribution of the vault length of Early Period vaulted structures. Note that while the largest and smallest vaulted buildings belong to the Early Period, Pure Florescent vaulted structures are usually larger than those of the Early Period. Three Early Period vaulted structures with vault lengths of 208, 118, and 54 meters, respectively, and one Pure Florescent vaulted structure with a vault length of 72 meters are not reflected in this figure. See pages 163-164 and Table 11.
Figure 18. Ground plan of structure 784 (J802g247), an Early Period vaulted structure.
Figure 19. Distribution of Early Period vaulted architecture on platform or terrace complexes at Dzibilchaltun. Each circle represents a platform or terrace complex containing Early Period vaulted architecture. The area of each circle is proportional to the total amount of constituent Early Period vaulted construction, measured as the sum of the lengths of all Early Period vaulted corridors erected on the platforms or terraces. Compare the distribution of Early Period architecture, all constructed during the second phase of the Early Period, with the distribution of Pure Florescent vaulted architecture illustrated in the following figure.
Figure 20. Distribution of Pure Florescent vaulted architecture on platform or terrace complexes at Dzibilchaltun. Each circle represents a platform or terrace complex containing Pure Florescent vaulted architecture. The area of each circle is proportional to the total amount of constituent Pure Florescent vaulted construction, measured as the sum of the lengths of all Pure Florescent vaulted corridors erected on the platform or terrace complexes. The scale is the same as the previous figure illustrating the distribution of Early Period vaulted architecture; the smallest circles represent about 10 to 16 meters of vault length. Of course many if not most of the Early Period vaulted buildings were still being used during the Pure Florescent Phase.
Figure 21. Distribution of all "late Classic" vaulted architecture on platform or terrace complexes at Dzibilchaltun. Each circle represents a platform or terrace complex containing Early Period, Transitional, or Pure Florescent vaulted architecture. The area of each circle is proportional to the total amount of vaulted architecture on the platform or terrace complexes, measured as the sum of the lengths of all vaulted corridors on the substructures. Note the tendency for the larger complexes to occur at the center of the site. Three areas can be defined on the basis of vaulted architecture distribution: 1) a central core consisting of between a quarter and a half of a square kilometer where vaulted architecture is particularly concentrated; 2) a central aggregate consisting of about 3 square kilometers where this type of architecture is clustered; and a peripheral zone, where vaulted buildings are situated in small, widely-spaced complexes.
Figure 22. Ground plan of the platform-terrace complex consisting of structures J865p590, J877p572, J833p582, and J883p587.
Figure 23. Ground plan of the platform-terrace complex consisting of structures K3501816, K3681827, K3751803, and K3851817.
Figure 24. Distribution of architecture on the map of Dzibilchaltun. This map was made by drawing a smooth curve around contiguous square areas measuring 50 meters in length and width that contained no mapped structures. These areas were left unshaded while areas containing architecture were shaded with diagonal lines. The black dots represent vaulted buildings; the principal sacbeob or raised causeways at the center of the site are also plotted. This map illustrates the fragmented appearance of the site; in prehistoric times the area on the map must have been partitioned into numerous small divisions that were either delineated by space between clusters of ruins or recognized by marked concentrations of various kinds of special architecture at different places on the map.
Figure 25. Reconstruction drawing of a cluster of ruins at Dzibilchaltun. Note the contrast between the carefully arranged buildings in the platform-terrace complexes and the disorganized appearance of the cluster as a whole. The cluster is centered in the southeast corner of map sheet 1(000-1,000)q(000-1,000). The artist faces southwest. Drawing by John C. Scheffler.
Figure 26. Distribution of vaulted buildings on the map of Dzibilchaltun. Each circle marks the location of a vaulted building. Circles shaded solid black represent Early Period vaulted buildings while unshaded circles stand for Pure Florescent structures. Circles left half shaded black and half unshaded are Transitional vaulted buildings. The three Black-on-Cream vaulted buildings are not located on this map. Note that the Pure Florescent vaulted buildings are far more concentrated than the Early Period vaulted buildings.
Figure 27. Contrasts in the cumulative percentage of Pure Florescent and Early Period vaulted architecture within 1,400 meters of the weighted centroid of all late Classic vaulted architecture. The sums of the vault lengths of the buildings are considered the total amount of architecture in each class. The weighted centroid of all late Classic vaulted architecture was found by multiplying each coordinate of a vaulted building by the vault length of that building. The sums of these quotients for the 237 late Classic vaulted buildings at the site are then divided by the sum of the vault lengths of those buildings. The percentage of the total amount of Pure Florescent architecture inside the circle with its center at the weighted centroid and its radius indicated by the distances on the abscissa scale is shown by the stars. The cumulative percentage of Early Period vaulted architecture encountered as one moves out from the weighted centroid is shown by the curve formed from circles. Comparison of the two curves indicates the Pure Florescent architecture is more highly concentrated than the Early Period architecture. See pages 188-189 and Table 15.
Cumulative percentage of architecture within distance

Distance from centroil in meters

Pure florescent curve: *
Early period curve: ○
Figure 28. Contrasts in the cumulative percentage of Pure Florescent and Early Period vaulted architecture within 4,000 meters of the weighted centroid of all late Classic vaulted architecture. The sums of the vault lengths of the buildings are considered the total amount of architecture in each class. The weighted centroid of all late Classic vaulted architecture was found by multiplying each coordinate of a vaulted building by the vault length of that building. The sums of these quotients for the 237 late Classic vaulted buildings at the site are then divided by the sum of the vault lengths of those buildings. The percentage of the total amount of Pure Florescent architecture inside the circle with its center at the weighted centroid and its radius indicated by the distances on the abcissa scale is shown by the stars. The cumulative percentage of Early Period vaulted architecture encountered as one moves out from the weighted centroid is shown by the curve formed from circles. Comparison of the two curves indicates the Pure Florescent architecture is more highly concentrated than the Early Period architecture. See pages 188-189 and Table 15.
CUMULATIVE PERCENTAGE OF ARCHITECTURE WITHIN DISTANCE

DISTANCE FROM CENTROID IN METERS

PURE FLORESCENT CURVE *
EARLY PERIOD CURVE ○
BIBLIOGRAPHY

Adams, Richard E. W.

Adams, Robert McCormick

Altschuler, Milton

Ancona, Eligio

Andrews, E. Wyllys IV


1968  Dzibilchaltun, a northern Maya metropolis. Archaeology 21:36-47.

1970  Balancanche, throne of the tiger priest. Middle American Research Institute, Publication 32. New Orleans: Tulane University.

Ascher, Robert


Bancroft, Hubert Howe

Bandeier, Adolph Francis

Barrera Vásquez, Alfredo

Barrera Vásques, Alfredo and S. Rendon

Bartlett, Harley Harris

Bates, Marston

Beals, Ralph L.
Birdsell, Joseph B.

Borah, Woodrow and Sherburne F. Cook

Borhegyi, Stephan Francis de


Brace, C. Loring

Brainerd, George Walton
1954 The Maya civilization. Los Angeles, Southwest Museum.


Bronson, Bennet

Budowski, Gerardo

1959a Algunas relaciones entre la presente vegetación y antiguas actividades del hombre en el tropico Americano. Actas del XXXIII Congreso Internacional de Americanistas (San Jose, Costa Rica, 1958). pp. 259-263.

1959b The ecological status of fire in tropical American lowlands Actas del XXXIII Congreso Internacional de Americanistas (San Jose, Costa Rica, 1958). pp. 264-278.
Bullard, William Rotch, Jr.


Bunzel, Ruth Leah

Carneiro, Robert Leonard


Carr, Robert F. and James E. Hazzard

Chamberlain, Robert Stoner

Chang, Kwang-Chih

Chappie, Eliot D.

Chardon, Roland Emanuel Paul
Cline, Howard Francis


Coe, Michael Douglas


Coe, William Robertson II

Conklin, Harold Colyer


Cook, Orator Fuller


Cook, Sherburne F.

Cook, Charles Wythe
1931 Why the Mayan cities of the Peten District, Guatemala, were abandoned. Journal of the Washington Academy of Sciences 21:283-287.
Cowgill, George L.

Cowgill, Ursula Moser


Cowgill, Ursula Moser and G. Evelyn Hutchinson


Cunningham, John F.

Dobyns, Henry F.

Doxiadis, Constantinos A.

Driver, Harold Edson

Dumond, Don Edward
Durkheim, Emile

Eggan, Fred

Emerson, R. A.
1953 A preliminary survey of the milpa system of maize culture as practiced by the Maya Indians of the northern part of the Yucatan peninsula. Annals of the Missouri Botanical Gardens 40:61-62.

Emerson, R. A. and J. H. Kempton

Ferdon, Edwin N.

Folan, William J.

pp. 181-199.

Ford, Cyril Daryl
1934 Habitat, economy and society. London: Methuen Press.

Gabel, Creighton

Gann, Thomas W. F.

Gates, William Edmond
1937 Yucatan before and after the conquest by Friar Diego de Landa with other related documents, maps, and illustrations. Baltimore: The Maya Society.
Goodman, Joseph Thompson  
1897  The archaic Maya inscriptions. Appendix to Biologia  
Centrali-Americana, Part IV Archaeology, by Alfred Percival  
Maudslay. London.

Groslier, Bernard and Jacques Arthaud  
1957  The arts and civilization of Angkor. New York: Praeger  
Publishers.

Hall, Edward T.  

Hanke, Lewis  
1935  The first social experiments in America. Harvard  
Historical Monographs No. 5. Cambridge: Harvard University  
Press.

1949  The Spanish struggle for justice in the conquest of  

Harris, Marvin  
1971  Culture, man and nature. Englewood Cliffs, N. J.  
Crowell Publishers.

Harrison, Peter I.  
1969  Form and function in a Maya "Palace" group. Verhandlungen  
des XXXVIII Internationalen Amerikanistenkongress (Stuttgart-  

Haviland, William Arthur  
1963  Excavation of small structures in the northeast quadrant of  

1966a  Maya settlement patterns: a critical review. Middle  
American Research Institute, Tulane University publication 26,  
pp. 21-47.

1966b  Social integration and the Classic Maya. American  
Antiquity 31:625-631.

1967  Stature at Tikal, Guatemala: implications for Classic Maya  
demography and social organization. American Antiquity 32:  
316-325.

1968b Ancient lowland Maya social organization. Middle American Research Institute, Tulane University publication 26:93-117.


Hester, Joseph A., Jr.


Higbee, Edward

Hollingshead, August B.

Huntington, Ellsworth


Jennings, Jesse D.

Joesink-Mandeville, Leroy V.
Jones, Morris R.


Kelley, David H.


Kroeber, Alfred Lewis


Kurjack, Edward B.


Lange, Frederick W.


Las Casas, Bartolomé de

1656 The tears of the Indians: Being an historical and true account of the cruel massacres and slaughters of above twenty millions of innocent people and committed by the Spaniards in the islands of Hispaniola, Cuba, Jamaica, etc., as also, in the continent of Mexico, Peru, and other places of the West-Indies, to the total destruction of those countries. John Phillips, translator. London.


Lévi-Strauss, Claude


Linton, Ralph


Lundell, Cyrus Longworth


Lynd, Robert Staughton and Helen Merrel Lynd
1929 Middletown, a study in contemporary American culture. New York: Harcourt, Brace, and Co.

Mayer-Oakes, William J.


Meggers, Betty J.


Miles, Suzanne White Law


Morgan, Lewis Henry


Morley, Sylvanus Griswald  

1917 The rise and fall of the Maya civilization in light of the monuments and native chronicles. Proceedings of the Nineteenth International Congress of Americanists (held in Washington, D.C., December 1915). pp. 140-149.

1920 The inscriptions at Copan Carnegie Institution of Washington, publication 219.

1946 The ancient Maya. Stanford University, California: Stanford University Press.

Morley, Sylvanus Griswald and George Walton Brainerd  

Murdock, George Peter  

Nuttall, Zelia  
1921 Royal ordinances concerning the laying out of new towns. Hispanic American Historical Review 4:743-753.

Pérez Toro, Augusto  

Pollock, H.E.D.  

Powdermaker, Hortense

Prescott, William Hickling

Proskouriakoff, Tatiana


Puleston, Dennis E.

Rapoport, Amos

Rathje, William L.

Redfield, Robert


Reina, Ruben E.


Relaciones de Yucatán

Ricketson, Oliver Garrison

Rosenblat, Angel

Rouse, Irving

Roys, Ralph Loveland


Roys, Ralph Loveland, France Vinton Scholes, and Eleanor B. Adams

Ruppert, Karl and A. L. Smith

Ruz, Alberto Lhuillier
1964a Aristocracia o democracia entre los antiguos Mayas? Universidad Nacional Autónoma de México, Anales de Antropología 1:63-75.

Sabloff, Jeremy A. and Gordon Randolf Willey

Sánchez de Augilar, Pedro

Sanders, William Timothy


1962b Cultural ecology of the Maya lowlands, part I. Estudios de Cultura Maya 2:79-121.


1965 The cultural ecology of the Teotihuacan Valley. Pennsylvania State University, Department of Sociology and Anthropology.


Sanders, William Timothy and Joseph Marino
Sanders, William Timothy and Barbara J. Price

Schaedel, Richard P.

Schloes, France Vinton and Ralph Loveland Roys


Seler, Eduard

Simpson, Lesley Byrd


Sjoberg, Gideon


Smith, A. Ledyard
Smith, Robert E.
1955 The ceramic sequence at Uaxactun, Guatemala. Two volumes. 
Middle American Research Institute, Publication 20. New Orleans: 
Tulane University.

Stanislawski, Dan
1946 The origin and spread of the grid-pattern town. Geographical 
Review 36:105-120.

1947 Early Spanish town planning in the New World. Geographical 
Review 37:94-105.

Steggerda, Morris
Publication 531.

Stephens, John Lloyd
1841 Incidents of travel in Central America, Chiapas, and 

1843 Incidents of travel in Yucatan. New York: Harper and 
Brothers.

Steward, Julian H.
1949 Cultural causality and law: a trial formulation of early 

1955a Introduction: the irrigation civilizations, a symposium on 
method and result in cross-cultural regularities. In Irrigation 
civilizations: a comparative study. Social Science Monographs I. 

1955b Some implications of the symposium. In Irrigation civil 
civilizations: a comparative study. Social Science Monographs I. 

Steward, Julian H. and Louis C. Faron

Stuart, George E., John C. Scheffler, Edward B. Kurjack and John W. 
Cottier
1965 Map of Dzibilchaltun, Yucatan, Mexico. Prepublication 
Distribution by the Middle American Research Institute. New 
Orleans: Tulane University.

Tax, Sol
1952 Chapter 3: economy and technology. In Heritage of Conquest, 
Termen, Franz

Thompson, Edward Herbert


Thompson, John Eric Sidney
1931 Archaeological investigations in the southern Cayo district, British Honduras. Field Museum of Natural History, Publication 301. Anthropological Series 17, No. 5.

1940 Late ceramic horizons at Benque Viejo, British Honduras. Carnegie Institution of Washington, Publication 528. Contributions to American Archaeology 35:


Torquemada, Fray Juan De
Tozzer, Alfred Marsten (editor and translator)

Tsukada, Matsuo

Tsukada, Matsuo, Ursula M. Cowgill, and G. Evelyn Hutchinson

Vogt, Evon Zartman


Vogt, Evon Zartman and Frank Cancian

Wagner, Helmut O.
Warner, W. Lloyd, M. Meeker, and K. Eels

Wauchope, Robert


1961 Ten years of Middle American archaeology: annotated bibliography and news summary, 1948-1957. Middle American Research Institute, Tulane University, publication 28, pp. 1-106.


West, Robert C.

White, Leslie A.

Willey, Gordon Randolf


Willey, Gordon Randolf and William Rotch Bullard, Jr.


Willey, Gordon Randolf, William R. Bullard, Jr., John B. Glass and James C. Gifford

Willey, Gordon Randolf, Culbert, T. Patrick, and Richard E.W. Adams

Willey, Gordon R. and Philip Phillips

Willey, Gordon R. and Demitri Shimkin
Wittfogel, Karl A.


Wolf, Eric Robert

Wright, A.C.S., Rommey, D.H., Arbuckle, R.H., and V.E. Vail