

Foreword

In the spring of 1986, having recently started the graduate program at SUNY, Albany, I received a letter from Paul Healy offering me the position of Assistant Director to a project he was about to launch at Pacbitun, Belize. The offer to join in Paul's new project was in many ways a continuation of a long, successful, and very productive research partnership that had been fostered since our first meeting in 1977. Needless to say, I immediately accepted Paul's invitation, and three months later, I was once again driving our project's pickup truck from Peterborough, Ontario to San Ignacio, Belize.

In so many ways, this first Pacbitun Project can be credited for several diverse successes and accomplishments. First, and what I personally consider as foremost, is the project's substantial contribution to the development of Belize's archaeological human resources. It was at Pacbitun, for example, that Winnel Branche, Allan Moore, John Morris, Alfredo (Jim) Puc, and Javier Mai either began or continued their training in archaeological field methods. Winnel, Allan, John, and I eventually became heads of Belize's Department, or more recently the Institute, of Archaeology, where some of us continue to work in the management of the country's tangible cultural resources. Jim Puc and Javier Mai likewise continue to work in heritage management at the Actun Tunichil Muknal and Offering Cave archaeological parks.

The first Pacbitun Project also served as training ground for many now established archaeologists and scholars. These include colleagues such as Gary Copeland, Joel Boriek, Cassandra Bill, Kitty Emery, Lori Wright, Polydora Baker, Melissa Campbell, Beverly Morrison, Clarence Ritchie, and Richard Garvin. Through the collaborative work of all these individuals, and under the direction of Paul, we were not just able to place Pacbitun on the archaeological map of western Belize, but also to establish the site as a major regional player in the political landscape of the Belize River valley. This early foundation has been expanded and enhanced considerably by Terry Powis and his colleagues whose important contributions to the significance of Pacbitun are professionally presented in this volume. It is also refreshing to see that Terry has continued Paul's and my tradition of collaborative research by investing in the training, mentoring, and development of younger colleagues. The diversity of papers in this volume are clear testimony of this tradition, and of the value of integrating a holistic approach to scientific enquiry.

Other commendable successes of both Pacbitun Projects are evident in their contributions to our knowledge of the Preclassic Maya, to our study of ancient Maya agriculture, settlement systems, and economic specialization, on the

function and meaning of monumental architecture, and on the socio-political relationship between Caracol and sites in the Belize Valley.

In closing, I would also like to recognize several Belizean colleagues who have passed to the great beyond, but whose participation in the research at Pacbitun resulted with significant contributions to our knowledge of the site. These colleagues include Don Valentin Cu, who served as foreman of the first project, Ventura (Tigre) Chi, Gumercindo Mai, Ireneo Magana, and Gustavo Manzanero. In so many ways, the information produced in this and other volumes on the Maya are only made possible because of their hospitality, their collaboration, and their shared interest to learn of the amazing achievements of their ancestors. This present volume on Pacbitun is truly a reflection of the collaborative approach that is embraced by those of us who conduct research in western Belize, and that has always been a major part of the Pacbitun Project since its inception in 1986.

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Introduction to the Archaeology of Pacbitun

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Archaeological investigations over the past four decades have provided significant insight into the rise and fall of the ancient Maya centre of Pacbitun. In the course of these investigations, a number of questions about the founding of Pacbitun and the subsequent politics and daily activities of the people have driven the most recent research at the site. Located to the south and east of the sites that compose the Belize Valley region in west central Belize, Pacbitun sits isolated, tucked into the foothills of the Maya Mountains (Figure 1.1). Just to the north are lands much richer in terms of arable soils and water sources for maize farming. Alternatively, Pacbitun's surrounding area provides its inhabitants access to resources not found in the Belize Valley. These resources included pine trees, slate, and granite to name a few. It is not known whether the site was initially settled for resource exploitation, or

for other reasons such as access to the numerous caves and springs located in the area. What is certain is that the site thrived economically and endured politically for more than 1800 years, spanning the Middle Preclassic (900-300 BC) through to the Late-to-Terminal Classic (AD 550-900). The research presented in this volume reveals a summary of this critical data on Pacbitun's humble beginning as a small farming community around 900 BC to its rise as one of the preeminent regional civic-ceremonial centres dating to 400/300 BC. We have also tracked extensively the ebb and flow of the site's prowess as the people of Pacbitun navigated the murky political waters of the Classic period (AD 250-900). As a result, we have been able to piece together many of their daily and ritual activities over the course of nearly two millennia.

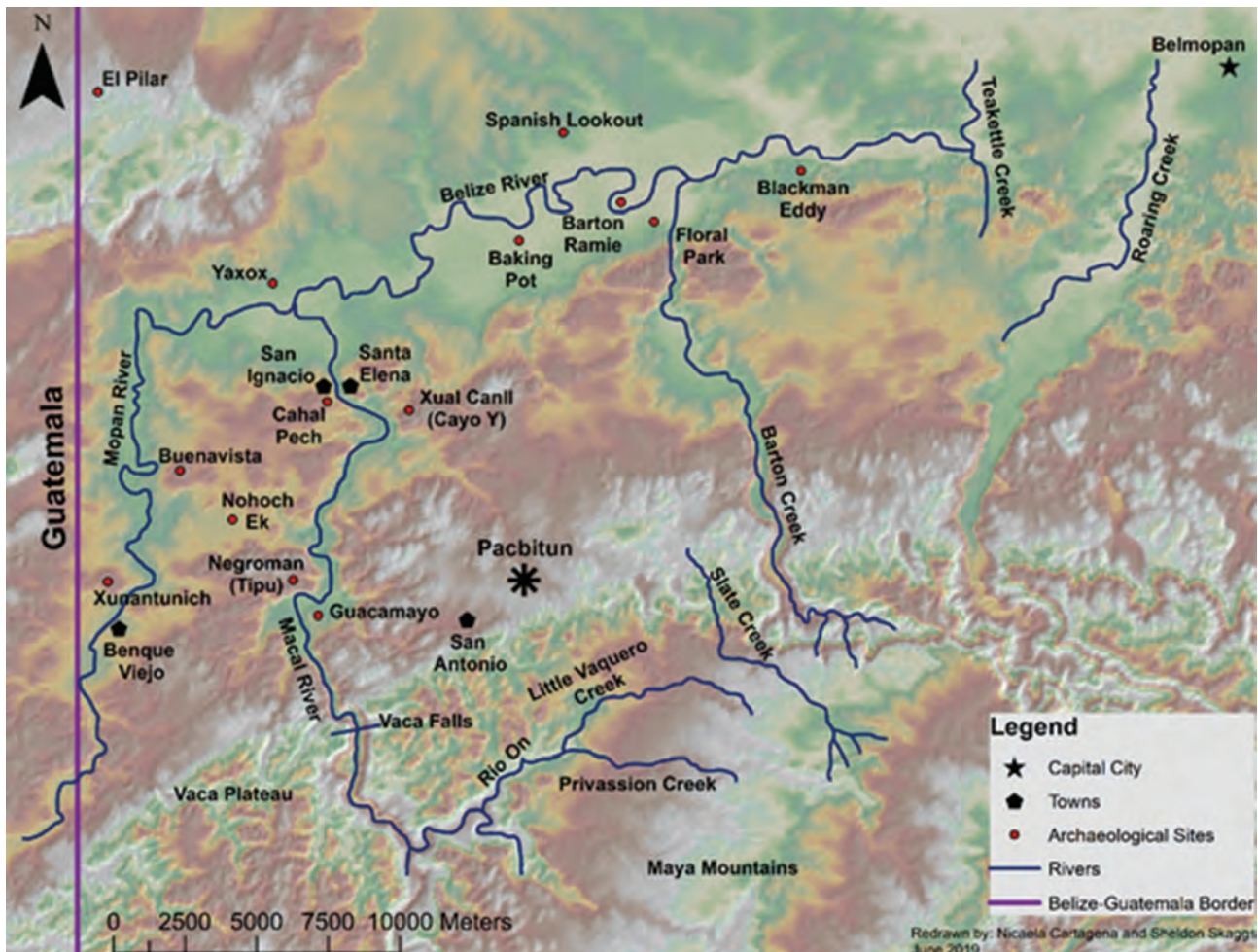


Figure 1.1. Map of Belize Valley showing location of Pacbitun. Map courtesy of Nicaela Cartagena.

The chapters in this volume are the culmination of a symposium entitled 'Researching the Ancient Maya of Pacbitun, Belize: A Decade of Archaeological Discovery' that was presented at the 2018 Society for American Archaeology meetings in Washington, DC. The primary goal of this symposium was to provide a current cross-section of archaeological research on the nature and significance of Pacbitun within the broader context of the Belize Valley and beyond. It was hoped that the symposium would help define and refine the cultural history of the site, by clarifying the cultural trajectory from its beginnings in the Middle Preclassic through to its denouement in the Terminal Classic period. In this volume, those presentations have been revised and updated to include recent findings, as well as provide new theories and methodologies regarding the social, political, and economic relationships between Pacbitun and other sites in the region. This volume also includes specialised analyses of ceramics, lithics, and organic remains that address questions of social and ritual life, and also the production, trade, and exchange of various material culture items.

The volume is divided into two themes: chapters dealing with the epicentre or core zone, and those dealing with the peripheral zone. Within each theme there are chapters dealing with research questions touching on all levels of society and spanning the 1800-year history. Before discussing the chapters in detail, it is important to briefly outline/summarise the previous archaeological projects at Pacbitun and the research focus by each project in their attempt to reconstruct the lifeways at the site. This historical summary combines less detailed descriptions of early research project achievements, presented in full in chapter two, with those from the last decade of archaeological activities at Pacbitun.

Project History of Pacbitun

Trent University-Pacbitun Archaeological Project (1984-1987)

Pacbitun, which means 'stone set on earth' in Yucatec Maya, was first investigated in the 1980s by Paul Healy of Trent University (Healy 1990a). Healy was drawn to Pacbitun because of the extensive hilltop terracing encircling the site. In order to better understand the terraced periphery, Healy began a limited testing programme in the central precinct in 1984. This fieldwork revealed a lengthy history of occupation for Pacbitun, spanning the Late Preclassic through Late Classic periods. Based on these initial results, he formed the Trent University-Pacbitun Archaeological Project and returned in 1986 and 1987 for more intensive study. Healy's project focused on two programmes of investigation: the core zone and the peripheral zone. His main goal was outlining the 'development and evolution of this Classic Maya centre and determining the role of intensive terrace agriculture' (see chapter two, this volume; Healy 1990a:249).

In the epicentre, Healy mapped 41 buildings that were arranged around five plazas (A-E) (Figure 1.2). In addition, he recorded two causeways, one reservoir, and 19 stone monuments. He investigated eight structures (Structures 1, 2, 4, 5, 14, 15, 23, and 38) in different plazas, with the majority of this work conducted in Plazas A and E. These plazas contain the site's E Group and ballcourt, respectively. Plaza A contained the greatest concentration of Classic period burials (n=20) and caches (n=19), many associated with the E Group structures (see chapter five, this volume). The majority of the 19 stone monuments found by Healy were also located in Plaza A. Many of the monuments were placed in front of structures associated with the E Group and, of these, three are carved (Altars 3 and 4, and Stela 6).

In the core and peripheral zones, Healy conducted extensive survey within a one square km area around the epicentre. A total of 330 mounds were mapped. Fifty of these mounds were tested (Campbell-Trithart 1990; Richie 1990; Sunahara 1995), with all of them producing Late Classic pottery. Based on his excavations, he was able to estimate a population size of about 6,000 inhabitants during Late Classic times (Healy *et al.* 2007).

These excavations into the monumental architecture and housemounds also allowed Healy to establish a ceramic sequence for Pacbitun (see chapter two, this volume). His five ceramic complexes were cross-dated with a number of other Belize Valley sites, including Barton Ramie (Gifford 1976).

Trent University-Preclassic Maya Project (1995-1997)

In the mid-1990s, Healy and Jaime Awe secured multi-year funding from the Social Sciences and Humanities Research Council (SSHRC) of Canada to pursue investigations of the earliest occupation of the site. Specifically, the main goal of the Trent University-Preclassic Maya Project was committed to a resolution of some key archaeological problems associated with the Preclassic Maya (Healy and Awe 1995), and to improve the understanding of an important lowland region (Upper Belize River Valley) which was under-represented for the temporal horizon (Healy and Awe 1995:3). At Pacbitun, research was targeted in Plaza B. In previous years, Plaza B had yielded the earliest architectural remains dating back to ca. 900 BC. With excavations located at the base of Structure 8 on the plaza side, Healy and colleagues identified the remains of four platforms (Sub-Structures B1-B4) that were buried beneath a late Middle Preclassic (ca. 600-300 BC) midden. These four platforms, two belonging to the early Middle Preclassic (900-600 BC) (Sub-Structures B1 and B4), and the other two dating to the late Middle Preclassic (600-300 BC) (Sub-Structures B2 and B3), were partially unearthened. Evidence for shell working was found in and around all four platforms. Thousands of shell beads, both finished and unfinished, along with production debris and chert micro-drills used to perforate the beads were found. The majority of the material was identified as conch shell

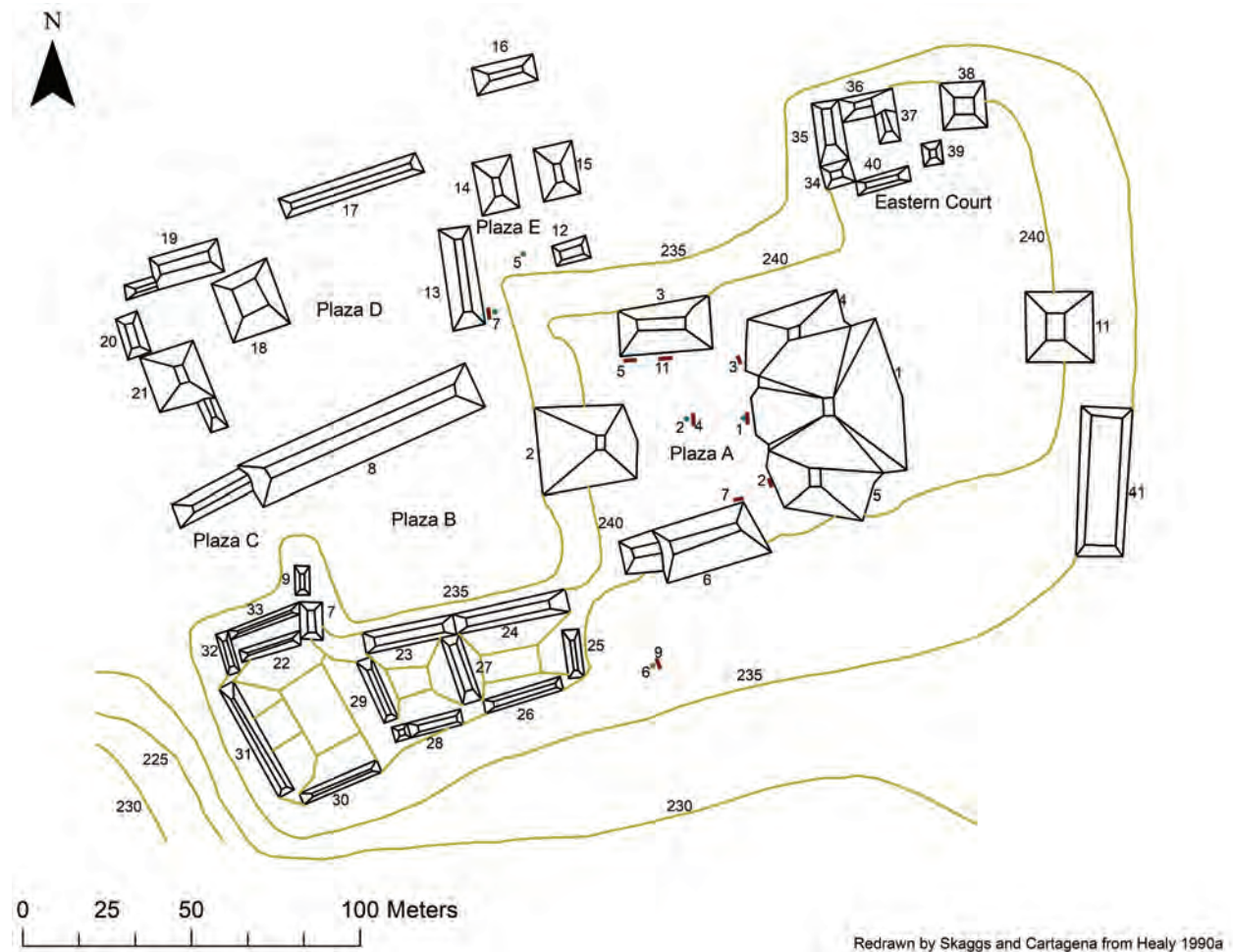


Figure 1.2. Map of Pacbitun site core. Map courtesy of Sheldon Skaggs and Nicaela Cartagena.

(specifically Florida Fighting Conch), a marine gastropod found in the Caribbean Sea some 100 km (60 miles) from the site. These workshops were used for nearly 600 years, indicating the economic importance of marine shells during the Middle Preclassic (see chapters three and four, this volume).

Pacbitun Preclassic Project (2008-2010)

Powis resumed excavations at Pacbitun after a decade-long hiatus, and assumed the role of PI, beginning in the summer of 2008. The first three years of this small project were focused exclusively on further defining the Middle Preclassic period in Plaza B (see chapter three, this volume). The investigations in the mid-1990s had revealed substantial Middle Preclassic domestic architecture, but none of the platforms had been fully unearthed. Powis' main goal was to horizontally expose Sub-Structure B2, which was accomplished in 2010. This rectangular platform measured 9 m east-west by 6 m north-south. Similar to the investigations in the mid-1990s, thousands of shell beads and shell detritus were recovered as well as several hundred chert drills. The beads and drills were found not only embedded in the floor of Sub-Structure B2 but also along the perimeter of the platform.

Pacbitun Regional Archaeological Project (2011-present)

In 2011, investigations modelled after the approach taken by Healy in the mid-1980s shifted to include research in the periphery. Healy had already mapped and sampled numerous housemounds and minor centres within a 2 km radius of the site, so emphasis of the new research involved other features such as production sites, causeways, and caves, (see chapters ten-fifteen, this volume). The Mai Causeway and Tzul Causeway, which extend from the site core out into the periphery, were surveyed but never excavated by Healy. One of the main goals of our causeway research was to determine when each was constructed. While it was clear that the Mai Causeway terminated at a large temple-pyramid complex (Structure 10), finding the termination of the Tzul Causeway was one of the primary goals of this research. It was important to determine whether the Tzul Causeway terminated at a minor centre in the periphery or at one of the dozens of caves that are located to the south of the site core. Research into the caves as well as other karst features (e.g., rockshelters, sinkholes) focused on asking questions concerning when, how, and why the Maya utilised these features throughout the Classic period.

Additional work in the periphery involved the investigation of another large-scale production locale.

Like the Pacbitun Maya of the Middle Preclassic, those in the Classic period were also producing goods needed at the site and perhaps traded to a wider region. In 2011, through the process of resurveying some housemounds along the edge of Healy's northwest transect, Drew Ward discovered an area where granite was crafted into manos and metates. Further excavations of this area suggest this was a large-scale groundstone production area—the first to be discovered in Belize (see chapter fourteen, this volume; Ward 2013).

In the site epicentre, the Middle Preclassic research focus shifted from the domestic architecture located in Plaza B to a search for ceremonial architecture in Plaza A (see chapter three, this volume). Because all research conducted in Plaza B to this point appeared to suggest that this area served a residential function from the Middle Preclassic onwards, it was reasonable to assume that Plaza A could have also had a continuous ceremonial function and would be the location of the first ceremonial constructions, buried beneath the plaza like the architecture in Plaza B. To aid in our sub-plaza search, we began a programme of geophysical survey in 2012, which included both magnetometry and ground penetrating radar. By sending microwave radiation into the ground and receiving the reflections of the waves off changes in soil, Skaggs was able to identify numerous anomalies in Plaza A. The most interesting anomaly, located at the north end of the plaza, revealed a large, nearly intact Middle Preclassic ceremonial platform designated by the excavators as 'El Quemado' (henceforth referred to as Q). Located about 50 cm below the present-day ground surface, Q measures 32 m (east-west) by 20 m (north-south) and stands approximately 2 m tall. The massive size of Q, and the need to backfill excavations at the end of each summer, meant that the entirety of the structure would never be completely exposed all at once. We therefore had employed both terrestrial laser scanning and photogrammetry each season, and then stitched the models together to visualize the structure as a whole (see chapter seven, this volume). Despite its accuracy, the time and expense required for laser scanning made it impractical to implement each season. High quality, overlapping photographs taken by Jeff Powis, supplemented with overhead drone photographs, were taken at the end of each excavation season. The images produced proved more than adequate for capturing all of Q's intricate details once processed using multiple 3D modelling software programs.

Given the size, scale, and time period of Q, we were forced to re-evaluate our understanding of the evolution of ritual practice in Plaza A. In 2015, investigations focused on the E Group and the development of this architectural complex. It was determined that the E Group was first constructed after the abandonment of Q around 400/300 BC (see chapter five, this volume).

As we came to learn more about the earliest history of Pacbitun's epicentre, we also wanted to expand

our knowledge of the Classic period residential developments of the nobility. We began an in-depth study of the courtyards in the site core, the presumed residences of the royal families during the Classic period. To date, we had no knowledge of those ruling the site other than elite burials recovered from the four structures of the E Group. This changed when a centre unit in Court 3, placed to capture the chronology of the courtyard's establishment and construction history, found multiple caches and seven individuals buried within four cist graves (see chapter six, this volume). Among the elaborate artefacts associated with these burials was an Ulúa Valley marble vase and marine shell finger-loops of an atlatl. Evidence of ritual practices in caching deposits included the discovery of obsidian and chert eccentrics. Other excavations in the centre of each courtyard and into structures revealed the rapid construction of this area and the growing restriction of access during the Late Classic period.

On the eastern side of Court 1 in Structure 25, the recovery of a carved altar fragment in 2017 led us to question our knowledge of the political history of the site during the Late and Terminal Classic periods. Found cached within a passage between rooms belonging to a previous late Late Classic construction phase, the carved altar fragment was identified as a piece of the Early Classic period Altar 3—a carved monument discovered within the largest building on site, Structure 1. Finding broken pieces of the same monument in different areas of the site core raised a number of questions regarding Pacbitun's role in the politics of the Belize Valley beyond the 8th century (see chapter nine, this volume). At this same time, we were recovering numerous Terminal Classic sherds from structures in the site core. In previous research efforts, Terminal Classic sherds were only found in the periphery. With a more robust assemblage of artefacts from this time period, we are beginning to understand the events that took place during the collapse and abandonment periods shortly after the 9th century (see chapter sixteen, this volume). The addition of this new evidence from the last 100 years of site occupation allowed the authors to make a revision of the chronology for the site. We modified the timing of Healy's Late Classic period to Terminal Classic period division, and also added an Early Postclassic period of AD 900-1000 (see Table 1.1), an addition that appears to correlate well with other Belize Valley sites.

As mentioned above, each chapter of this volume is divided between two organising themes based on research conducted in either the epicentre or the peripheral zone. The remainder of this introduction is an overview of each chapter. For the epicentre research, chapters are organised chronologically starting at the Middle Preclassic through to the Late-to-Terminal Classic. For the peripheral zone research, chapters will focus almost exclusively on the Classic period, as there is little to no evidence yet that Preclassic occupation occurs in the hinterland area of Pacbitun.

Table 1.1. Refined Pacbitun chronology and ceramic sequence of Pacbitun (adapted from Healy *et al.* 2004:208).

Time Period	Cal. Years	Pacbitun		Belize Valley			Pasion	Petén	
		TU-PAP*	PRAP**	Barton Ramie	Cahal Pech	Xunantunich	Ceibal	Uaxactun	Tikal
Postclassic	---1100---								
Early Postclassic	---1000---		Canto	early New Town	New Town		Samat		Caban
Terminal Classic	---900---	Tzib	Tzib	Spanish Lookout	Spanish Lookout	Task'	Bayal	Tepeu 3	Eznab
	---800---		late Coc						
Late Classic	---700---	Coc	early Coc	Tiger Run	Tiger Run	Hats' Chaak	Tepejilote 3	Tepeu 2	Imix
							Tepejilote 2		
						Samal	Tepejilote 1	Tepeu 1	Ik
Early Classic	---600---	Tzul	Tzul	Hermitage	Hermitage	Ak'ab	Junco 4	Tzakol 3	Manik 3
	---500---						Junco 3	Tzakol 2	
	---400---						Junco 2		Manik 2
Terminal Preclassic	---300---	Ku	Ku	Floral Park	late Xakal	Pek'kat	Junco 1	Tzakol 1	Manik 1
	---200---						Xale 3	Chicanel	Cimi
	---100---						Xale 2		Cauac
	-1 BC/AD-			Mount Hope			Xale 1		
Late Preclassic	---100---	Puc	Puc	Barton Creek	early Xakal	Ok'inal	Cantuste 3	Chicanel	Chuen
	---200---						Cantuste 2		
	---300---								
Middle Preclassic	---400---	late Mai	late Mai	late Jenney Creek	late Kanluk	Nohol	Cantuste 1	Mamon	Tzec
	---500---						Esocba 3		
	---600---						Esocba 2		
	---700---	early Mai	early Mai	early Jenney Creek	early Kanluk	Muyal	Esocba 1	Eb	late Eb
	---800---						Real 3		early Eb
	---900---						Real 2		
Early Preclassic	---1000---			?	Cunil		Real 1		
	---1100---								

*TU-PAP = Trent University-Pacbitun Archaeological Project (Healy 1990a)

**PRAP = Pacbitun Regional Archaeological Project (Powis *et al.* 2017).

Investigations in the Site Epicentre

In chapter two, Healy introduces the early history of archaeological research at Pacbitun, including the site discovery, initial project objectives, and chronology. He reviews the environmental setting of Pacbitun and the wide range of resources that the ancient inhabitants were able to exploit from both the tropical rain forest and the Mountain Pine Ridge. Specifically, Healy details the rich flora, fauna, and geological resources offered by the diverse environs. The most significant architectural features of the

site within this natural setting are characterised. An outline of the major excavations of 1984-1987 and 1995-1997 follows, with highlights about the investigations of key structures and associated burials, caches, and monuments. Results of a multi-year settlement pattern survey of Pacbitun and its periphery, with demographic estimates, are noted. Evidence for early artefact production and inter-regional trade are also reported.

In chapter three, Powis focuses on gaining a more comprehensive understanding of the Middle Preclassic

(900-300 BC) community at Pacbitun. Multi-year excavations of sub-plaza deposits in the plazas and courtyards of the central precinct have revealed considerable architectural and artefactual remains dating to this early time period. This chapter elaborates on and synthesises the new information gathered from these more recent investigations across the site core and then explains how this data has contributed to our knowledge of the Middle Preclassic occupation. Powis ends this chapter by comparing Pacbitun to other early Maya sites located in the Belize Valley and across the lowlands.

In chapter four, Boileau and Stanchly examine Pacbitun's Middle Preclassic community through the lens of faunal use. The assemblage is composed of faunal material gathered from excavations in Plaza A and B over the past two decades. The primary function of these areas, enduring as ritual and residential locales respectively throughout the site's occupation, resulted in two diverse assemblages that provided information concerning acquisition, consumption, and deposition of a broad range of vertebrate and invertebrate specimens. This examination was also able to detail craft production, economic exchange, and social differentiation as well as ritual/domestic function, each helping to reveal diverging groups and communal activities during the Middle Preclassic leading to potential access restrictions for animal resources. Ultimately, the comparison of faunal patterns would illuminate the evolving social class dynamics emerging early at the site.

In chapter five, Micheletti discusses the changing role of the E Group architectural complex. A recent re-examination of E Group complexes in the Belize Valley has determined that these assemblages share a unique set of attributes atypical of the E Group that would ultimately designate these assemblages as a variant form of this archetype (Awe *et al.* 2017). Also exhibiting the unique attributes of the Belize Valley regional variant, now referred to as an Eastern Triadic Assemblage, Pacbitun's complex was used as a primary example of the regional study. In this chapter, Micheletti provides an in-depth assessment of Pacbitun's E Group assemblage through a temporal examination of its construction history to identify the installation and development of the attributes that now label this assemblage an E Group variant. Each construction episode clearly demonstrates Pacbitun's early connection to the Belize Valley, the assemblage sharing most of the physical characteristics that differentiate this region's architecture from the quintessential E Group complex. Yet, certain attributes exhibited after the initial construction phases are not as distinct and actually conflict with the regional designation. The study in this chapter finds that the attributes that connect Pacbitun's assemblage to the Belize Valley regional variant are not wholly expressed until a Late Classic construction event.

In chapter six, Skaggs and his colleagues examine the structures that compose Pacbitun's palace courts bounding the southern edge of the site core. These excavations would build on the investigations of Structure 23 starting

in 1987 to enhance our understanding of what was believed to be Pacbitun's royal residency. From 2016-2019, excavations have focused on the centre of each courtyard, set to determine the chronological sequence of construction, as well as several of the range structures that surround the courtyards. Discoveries beneath the central courtyard (Court 2), similar to those in Plaza A and B, continue to increase our understanding of the Middle Preclassic community. The structures and courtyards of the adjacent courts (Courts 1 and 3), on the other hand, appear to have all had a much later origin, the majority dating to the onset of the Late Classic period (AD 550). Interestingly, the construction of Courts 1 and 3 appear to be associated with a site-wide Late Classic construction event brought about by a sudden florescence at Pacbitun. Through an examination of the architecture, access, caches, and burials of these palace courtyard groups, we consider the likelihood that the courts served as a royal residence of the site.

In chapter seven, Vaughan and his colleagues synthesise the current research practices of using mapping-grade photogrammetry at the site of Pacbitun. Advanced geospatial recordation and survey methods have always been a part of research at Pacbitun. Since 2015, a programme of photogrammetric modelling of excavation operations has taken place, to capture images used to then create 3D models. This chapter addresses the challenges and successes in creating mapping-grade 3D models derived solely from digital photographs. By taking a flexible, iterative approach, the authors have overcome the challenges in deploying and organising photogrammetry in settings hostile to both accurate GPS data collection and photography.

In chapter eight, Cheong discusses wind instrument production at the site. The ancient Maya were known for their rich ceremonial lifestyle in which music produced by instruments played an important role as shown on the murals of Bonampak. While other sites have produced more instruments than Pacbitun, our excavations have revealed a wider range of types, forms, and sound variety than any other Classic period site. The context of the instruments were examined using macro- and micro-analysis and petrographic analysis finding that some had been produced locally. A full listing and description of the assemblage is provided for comparison at other Maya sites.

In chapter nine, Micheletti and colleagues examine Classic period political affairs of Pacbitun through an extensive examination of two carved monuments at the site. Stela 6 and Altar 3 are thought to date to the Early Classic period, determined stylistically through epigraphic and iconographic analysis, and archaeologically through contextual analysis. As this chapter will demonstrate, the modes of analysis used to date these monuments also provide clues to the political status of Pacbitun before and after the Early-to-Late Classic transition. Text and imagery of Stela 6 and Altar 3 contain toponyms that not

only reference the realm(s) of Pacbitun but may also name other locales associated with potential affiliates. More importantly, Stela 6 appears to include a statement that would confirm the site's subordinate status in the latter half of the Early Classic. The context and condition of these monuments are also discussed in depth and appear to be congruent with archaeological evidence that may suggest conflict and subsequent socio-political change.

Investigations in the Site Periphery

In chapter ten, Spenard and his colleagues provide a summary of the ceremonial use of Pacbitun's karstscape, including caves and rockshelters. The discussion details the many types of karstic landmark features that fall within the category of *ch'een*, an area considered by the ancient Maya to be portals to powerful deities and other non-human agents. The chapter includes a description of several of these landmarks and associated modifications for rituals, most of which are thought to be associated with water. The authors' investigations find that the use of ritual landmarks, starting as early as the Late and Terminal Preclassic periods, had intensified by the Late and Terminal Classic periods and may have been controlled by Pacbitun elite. Their study also illuminates cultural ties with Xunantunich evinced in the abundance of Late Classic pottery types associated with this Belize Valley centre found within karst deposits at Pacbitun.

In chapter eleven, Parker and Spenard outline the paleoethnobotanical work conducted in the karstscape at Pacbitun demonstrating the vast history of plant use in such spaces. In particular, the burning of wood from spiritually significant trees was a critical component of Late Classic Maya cave rituals. Through examination of the control of specific resources, it is possible to evaluate the role these ritual spaces played in the lives of regular people and the presence of a centralised religious authority. Details of all identified species offer more nuanced pictures of the diverse spiritual needs of the Maya throughout the Pacbitun community.

In chapter twelve, King and his colleagues explore absorbed residues found in ceramic containers and bone tubes recovered from caves, mortuary contexts, and ritual caches in the Pacbitun region. The ceramic vessels presumably held liquids consumed or otherwise used in rituals in these settings, while the bone tubes may have delivered substances to participants in those rituals. Results of their analyses shed light on the kinds of substances used in rituals associated with caves, enemas, and caching.

In chapter thirteen, Weber and Spenard investigate the complex causeway systems connecting non-settlement cultural constructions and features such as caves and springs in the periphery of Pacbitun. Causeways are ever-changing assemblages associated with socio-economic and ideological developments in the periphery of the site. Using traditional and geospatial investigation methods, the authors determine to what extent traces of these

influences are observable in the archaeological record. This chapter seeks to identify whether the causeway systems allow for interpretation of changing ideological motivations during the Late-to-Terminal Classic period? Understanding the Pacbitun causeway system within the centre and its connections in-between structures and caves in the periphery will hopefully aid in our understanding of the ancient Maya people who once lived in and around Pacbitun.

In chapter fourteen, Skaggs and colleagues investigate granite groundstone artefacts from the Tzib Group, a small group of mounds located in the periphery of Pacbitun. Numerous manos and metates, in various stages of production, along with production debris and the stone tools used to manufacture these implements were found at the Tzib Group. Using the pXRF method discussed by Tibbits in chapter fifteen of this volume, it was determined that the Maya of Pacbitun were obtaining the raw materials for production from the Mountain Pine Ridge, located just a few kms south of the site. The layout of the Tzib Group, the tools used by their makers, and the debris left behind aids in the interpretation of groundstone production, use, and distribution.

In chapter fifteen, Tibbits examines the ability of portable X-ray fluorescence (pXRF) to generate accurate geochemical signatures on coarse-grained granite. The accuracy of this new use of pXRF was tested by comparison between thin section petrography and lab-based XRF to the pXRF results. The results indicate that when using the average geochemical signature of a minimum of five data points per sample, pXRF produces results that are statistically indistinguishable from lab-based XRF. With this accurate geochemical signature obtained with pXRF for the three granitic plutons within the Maya Mountains, the author was able to match groundstone tools produced at Pacbitun to the correct granite source material.

In chapter sixteen, Helmke and Ting analyse mould-made Terminal Classic pottery from the periphery of Pacbitun. The Terminal Classic witnesses the disappearance of polychromatic decorations and the appearance of highly decorated and near-identical, mould-made ceramics. The emergence of the molded-carved tradition is intimately correlated to increasing decentralisation of power and the fall of the institution of kingship. The vast majority of these moulded-carved ceramics were consumed and utilised by non-royal social segments that rose to power in the vacuum left in the collapse of the system of divine rulership. These moulded-carved ceramics are so distinctive that they serve as horizon markers for the whole period. Based on the evidence from various sites in the eastern lowlands, the production of these vessels is characterised by the co-existence of multiple traditions, including those based on volcanic ash and calcite pastes. Through an analysis of the imagery and associated texts, along with the physical properties of these vases, these traditions serve as a framework for revealing the production features, subsuming the selection of raw materials, paste

preparation, forming, surface finish and firing methods, as well as determining the spheres in which the vases were circulated and how Pacbitun prospered in these spheres.

In sum, this volume presents the fruits of a decade of continued research at the ancient Maya site of Pacbitun, Belize. Continuing the research goals of Paul Healy, the authors have used innovation along with novel methods and data to investigate both the epicentre and peripheral zones of the site. Traditional excavations in the site core have revealed expanded ceremonial and domestic areas and activities, and defined new aspects of the cultural history of the site. The investigation of the karstscape, causeways, along with specialised analyses of ceramics, lithics, and organic remains help to answer questions about the social and ritual life, and also the production, trade, and exchange of various material culture items. Throughout all the years of work, the researchers at Pacbitun have strived to adopt innovative methodologies and technologies in order to gather new and accurate archaeological data for the benefit of future research.

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