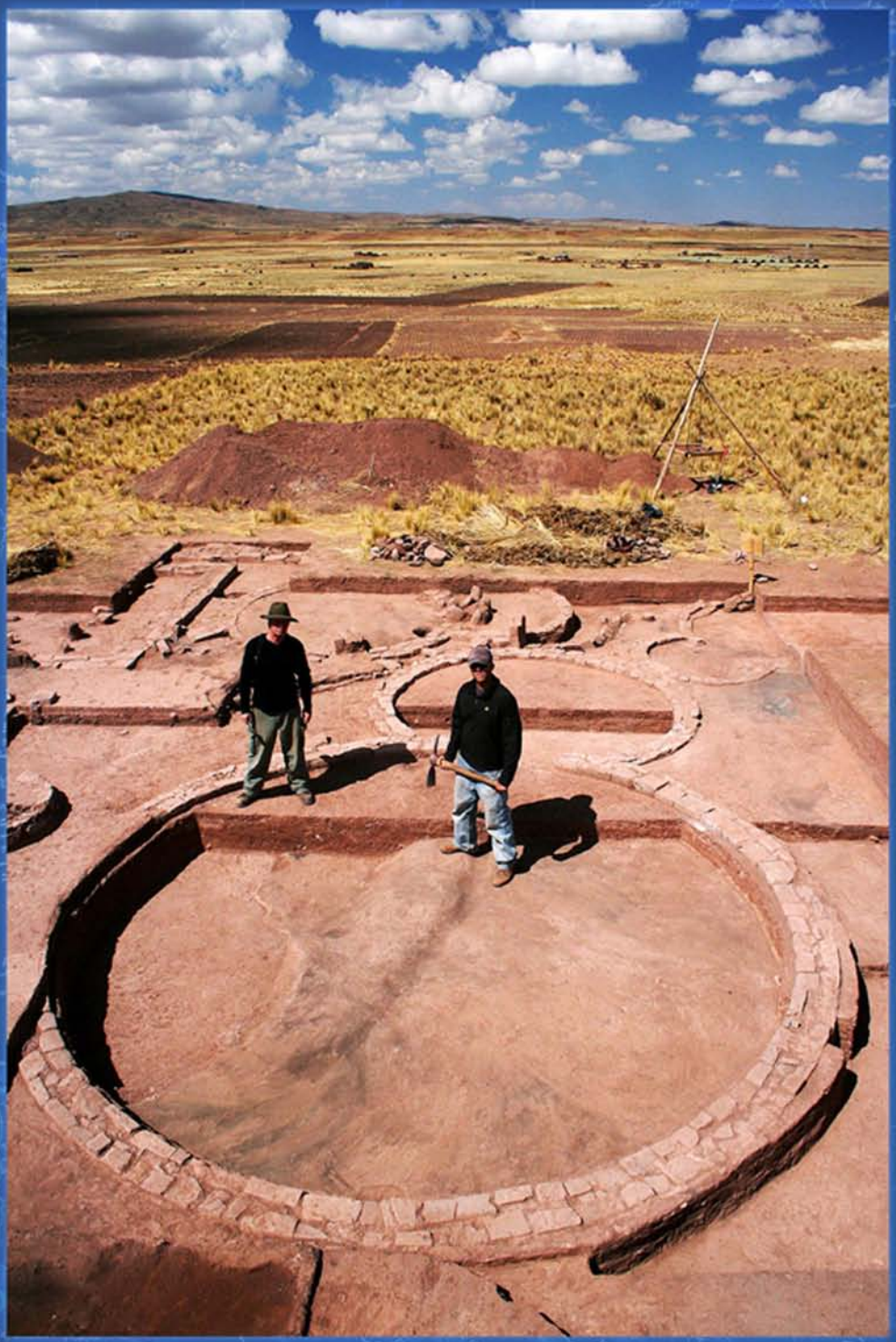

Advances in Titicaca Basin Archaeology–2

Edited by

Alexei Vranich and Abigail R. Levine

Advances in Titicaca Basin Archaeology-2

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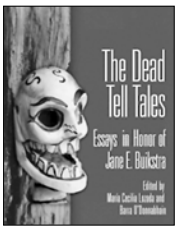

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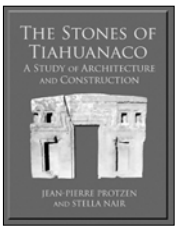

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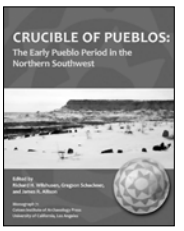

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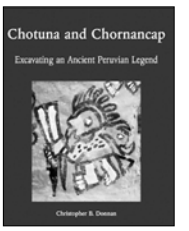

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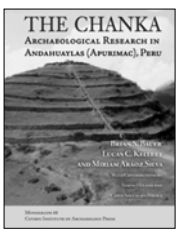

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Advances in Titicaca Basin Archaeology-2

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Monograph 77

Cotsen Institute of Archaeology
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PREFACE

This volume is the second in a planned series of studies on the archaeology of the Titicaca Basin, an area encompassing over 50,000 km^2 that has been endowed with a long and rich archaeological past. The actual region that was influenced by the cultures of the Titicaca Basin covers almost four times as much area, from northwest Argentina to San Pedro de Atacama, Chile, and into the Amazonian drainage. Over the last hundred years, scholars have painstakingly pieced together the fragments of this past. This series will provide a venue where new data garnered from recent investigations and consequent interpretations of the greater Titicaca region can be published.

The editors—Alexei Vranich and Abigail R. Levine—would like to thank the individual authors for both their submissions and their patience in producing this noteworthy volume. After the publication of *Advances-1* in 2005, we received a much larger collection of outstanding contributions than we had anticipated. As a result, we decided to divide these studies into two volumes: one focused on the southern Titicaca region, the area that would become the core of the Tiwanaku heartland, and a second one concentrated on the northern half of the basin that will be published as *Advances-III*. The work in the northern Titicaca region in the last few years has been quite extensive, transforming our ideas of what was once considered peripheral to the region as a whole.

Many people have provided assistance in the long process of preparing this volume for publication. In particular, we would like to especially recognize Greg Dobie and Carol Leyba for their tremendous work and dedication toward seeing this volume toward completion. We thank Mr. and Mrs. Lloyd Cotsen for their continuous support of the Institute's mission, including the publication of archaeological monographs and books.

Dedicated to the memory of
Rebecca J. Lang (1982–2005).

Chapter 1

Introduction

Alexei Vranich and Charles S. Stanish

The field of Titicaca Basin archaeology has advanced significantly since the publication of *Advances in Titicaca Basin Archaeology-1* in 2005. The majority of the contributions in this first volume presented the results of large-scale surveys that covered areas not visited previously by professional archaeologists. The potential to find undiscovered sites and reconstruct the distribution and chronologies of entire cultures constitutes both the challenge and pleasure of working in the Titicaca Basin. The contributions in this volume demonstrate a maturation of the field of Titicaca Basin studies. Large-scale surveys will need to continue, and as one contribution in this volume demonstrates (Bandy, chapter 7), areas will need to be revisited as we continue to refine our chronologies and understanding of site-formation processes. Fortunately, the field has arrived at the point at which we have developed a firm understanding of the patterns of settlements that permits us to start investing energy on single locations.

For the sake of time and space, we have not included an overview of the Lake Titicaca Basin area. Readers should refer to the introduction in *Advances-1* for a geographical description, chronological overview of the basin, and history of investigations. The contributions are grouped by time period and region, which in practical terms breaks down to research done in the Jesús de Machaca valley in and around the Formative period site of Khonkho Wankane and research conducted in the Tiwanaku valley (Torres-Rouff, chapter 14, literally covers the entire altiplano). The authors were asked to keep in mind, if not directly reference, the data of the other contributing scholars working in their region and time period. The intended effect is to create a smoother read and provide multiple perspectives on the same social phenomenon.

North and South Basin

As mentioned in the preface, we divided the material submitted for this series by geography: north and south basin. This division corresponds to the present-day political boundary between Bolivia and Peru and to their different research traditions in the fields of archaeology. In Bolivia, Tiwanaku is both the largest site and a national monument; consequently, most highland research focused on the site itself or on adjacent locations that in some way explained the later monumental development. Scholars had to demonstrate how their research and data were related to the rise, maintenance, and eventual collapse of this iconic site. Scholars to the north similarly labored under the specter of Tiwanaku, but they had to contend with the idea that they were seen as merely precursors and an eventual colony of Tiwanaku or as a marginal area under the influence of Chavin to the north. Even to Peruvian scholars, already overwhelmed by a rich archaeological history and endowed with a continent's share of world heritage archaeological sites, the north basin was somewhat peripheral.[1] In effect, the north basin was understudied and underappreciated on either side of the border, but for different reasons. As

John Janusek demonstrates in this volume (chapter 2), an overemphasis on the rise and supremacy of Tiwanaku has influenced, and continues to influence, both methods and interpretations.

Research Projects in the Titicaca Basin

Until recently, projects in the south basin concentrated geographically and chronologically on the site of Tiwanaku. Proyecto Wila Jawira (University of Chicago) of the 1980s and early 1990s expanded this narrow focus and set a model for large-scale multidisciplinary collaboration. Undertakings such as Proyecto Jach'a Machaca (Vanderbilt University) in the Jesús de Machaca valley, Proyecto Jach'a Marka (McGill University) and Proyecto Arqueológico Pumapunku-Akapana within the core of Tiwanaku (University of Pennsylvania), and Proyecto Arqueológico Taraco (University of California, Berkeley) on Formative period sites of the Taraco Peninsula can trace their intellectual genealogy or owe a great deal of credit to the founding efforts of Proyecto Wila Jawira. It is critical to note that all these projects have benefited from the participation of Bolivian scholars in their capacity as official state archaeologists or as university students gaining experience in field methods and research. The number of contributions by Bolivian scholars in this volume does not reflect their effort or the scale of their contribution to the advancement of the archaeology, but rather the realities of the pressures and responsibilities of their civil service positions and the lack of resources at the institutional university.

In this light, it is curious that Programa Collasuyo, with its headquarters in Puno, Peru, has little genealogical relationship to Proyecto Wila Jawira, but rather traces its origins to Programa Contisuyo in Moquegua, Peru. Whereas the Bolivian projects emphasized large-scale excavations augmented by regional surveys, the Peruvian project centered initially on large-scale surveys augmented by targeted excavations. This separation of research infrastructures parallels, unfortunately or not, the aforementioned national boundaries and intellectual interests that derive from them. Programa Collasuyo commanded larger areas of the landscape and conducted surveys in the northern basin. In the upcoming *Advances-III* we will see the results of these surveys as those scholars settle on key areas they identified with a view to developing a refined chronological framework, such as ceramics, dating, and the form of the sites. *Advances-III* will also contain contributions from the lower-elevation temperate valleys that were part of the circum–Titicaca Basin cultural area. This volume is exclusively about the southern basin within the boundaries of the modern republic of Bolivia.

Emergent Themes in Recent Titicaca Basin Research

The contributions are not only the product of intensive individual researchers pursuing their own research agendas but also bear traces of the scholarly and collegial interactions among the authors. As a result, a number of exciting and innovative themes emerge in this volume that contend with theoretical, methodological, and empirical topics of great interest that have reformulated our concept of Tiwanaku and the development of social complexity.

The Formative Period as the Key to Understanding the Tiwanaku Phenomenon

If Tiwanaku casts a long shadow across the central Andes, its presence in the southern basin constitutes an intellectual obscurant. The emphasis on its monuments and sculptures at an imagined apogee has tended to veil the wealth of information from the earlier millennia from which many of its organizational structures developed. Several contributions have demonstrated the need for investigators to go back to a period when Tiwanaku was just one of many small centers in the basin. The tantalizing question is why, at some point, and for pertinent reasons, Tiwanaku outpaced its rivals and became the largest site in the basin. That variable, or to use a more popular phrase, that tipping point, will most certainly be the focus of research and debate for years to come, albeit comprising intangibles that may never be fully recovered in archaeological contexts. The Formative period, then, has become a focus of south basin research in its own right which is

clearly becoming the prime location that will allow researchers to understand later developments.

Hastorf's contribution (2005) in *Advances-1* is a necessary review prior to reading the Formative period contributions from this volume. The fragile and ephemeral remains of the Formative period required a distinct method of excavation in order to recover the modest evidence of everyday life as well as those of communal activities in these small but central places. Contributions from this volume show the influence of Hastorf's method of careful study of often overlooked information, such as fish bones and scales (Capriles, chapter 9; Marsh, chapter 4), and the conviction that some of the political and social institutions of the later political archaic state of Tiwanaku could be identified in the Formative period. This framework does not suggest a unilinear trajectory but rather reflects a series of both small and large transformations over many generations.

Janusek (chapter 2) presents the historical background for the development of the field of archaeology in the southern basin and demonstrates how a history of accomplishments, false starts, and wrong turns relegated the Formative period to a place of lesser status and importance. Prior to Janusek's research project, the monumental site of Khonkho Wankane was considered to be a provincial Tiwanaku center, located and built by the emerging Tiwanaku empire as it consolidated its control over the southern basin and prepared for a more ambitious imperial career. His research, and that of his collaborators in the subsequent chapters, shows how the site was in fact a large and monumental settlement during the Formative period, whereas the Tiwanaku occupation, or reoccupation, was comparatively quite small. Providentially, shallow soils and good preservation provided Janusek with the opportunity to direct a program of broad horizontal excavation that exposed a large area of the layout and the transformation of public and ritual space over several centuries up until the explosion of the Tiwanaku phenomenon.

LARGE-SCALE PATTERNS: FORMATIVE PERIOD

In a few intensive field seasons, the excavations at Khonkho Wankane afforded investigators a broader view of this form of incipient Andean complexity. Scott Smith (chapter 3) and Arik Ohnstad (chapter 5) ascertained that the conceptual and social foundation for the later Tiwanaku polity can be found in this well-preserved site. Employing geophysical surveys and excavations, Smith presents the most complete view of the layout of a Formative period site, establishing, among other things, a close spatial relationship between residential and ritual areas, changes in elevation to define ritual and residential space, and a flexible use of ephemeral walls to transform space and experience effectively. Ohnstad attempts to place the ritual focal points of these constructed spaces—the carved monoliths—in their chronological and architectural context. He presents detailed illustrations of these important carvings, correcting previous flawed drawings and noting places of wear and damage. In the process, Ohnstad revalues one of the more important contributions by Bolivians to basin archaeology (Portugal Zamora 1936, 1937, 1941), which had been forgotten in the intellectual and political climate described by Janusek (chapter 2).

Leonardo Benítez (chapter 8) measures the ideological development from the earliest periods of public architecture to its foundation in the mature monumentality of Tiwanaku. Using established archaeoastronomical methods, he documents basic concepts in architectural design and site placement of Formative period architecture at three locations: Tiwanaku, Khonkho Wankane, and the Taraco Peninsula (Chiripa, Kala Uyuni, and Sonaje). He posits that the initial placement and the design of the first monuments at Tiwanaku were ideological compromises between the different early ritual traditions. The ritual architecture at Tiwanaku served as an ideological compromise that attracted a concentration of peoples with diverse ideologies and lifestyles.

LARGE-SCALE PATTERNS: THE SITE OF TIWANAKU

The unfortunate truth is that, due to a variety of preservation issues and the highly political nature of working at the site, Tiwanaku is not the optimal place to study the origins of primary state formation. Even the remains from its apogee are

heavily damaged or have eroded away over the centuries. Nevertheless, nearly a century of mapping and excavation helps us refine our ideas of the development and form of Tiwanaku across the estimated 4–6 km^2 extent of the site.

The contribution by Jason Yaeger and Alexei Vranich (chapter 11) uses a series of new carbon dates to place one of the buildings—the Pumapunku complex—in a more secure chronological context. Although more research is necessary before one can speak with greater confidence of the development of the entire site, these new data, combined with previous research (Manzanilla 1992; Janusek 2003a), allow Yaeger and Vranich to propose a construction sequence of one of the primary monuments of the Tiwanaku core, from its initial construction to its abandonment and later reoccupation by the Incas. This reconstruction proposes the concept of a dynamic architectural core where monuments were built, abandoned, rebuilt, and decommissioned, all in the space of a few generations. The result is a greater awareness of the dynamic nature of Tiwanaku society and its architecture.

Yaeger and Vranich's overview of the construction of the monuments provides a background that permits researchers to appreciate the complexity and achievement of the geophysical and excavation results reported by Michele Koons (chapter 12). The complete loss of nearly all but the most monumental remains has left the stone-faced buildings floating isolated from what must have been a complex site. Previous scholars have shown that large-scale horizontal excavations are worth their expense many times over, but even these impressive excavations appear small when placed in the context of 4–6 km^2 of the site. At the time, Koons's geophysical work was the largest archaeological subsurface survey ever completed in the Americas, and it provides a broad spatial description of the basic features of the core, confirming and contextualizing previously noted spatial patterns (Janusek 2002; Couture and Sampeck 2003).

Nick Bentley (chapter 10) adds additional spatial information on the layout of Tiwanaku with a select transcription of Adolph Bandelier's notes and unpublished maps. The accurate and aesthetically pleasing maps by Bandelier provide a snapshot of the ruins a few short years before the wholesale quarrying of stone for the train trestles and bridges of the nearby railroad. The location of these now-missing remains informed both the excavation and the subsurface survey, demonstrating the potential for collaboration among the fields of history, archaeology, and geophysics.

DEMOGRAPHIC CHANGES

Matt Bandy (chapter 7) uses the results of a questionnaire given to Tiwanaku scholars as a means both to present his survey data and to critically evaluate ideas on the size and purpose of the site. Armed with a refined ceramic chronology (Lémuz Aguirre 2001; Janusek 2003b; Bandy 2001), he revisits the southern basin valley survey and concludes that the initial population concentration at Tiwanaku occurred in the Late Formative period (his informed guess is AD 200), the effect of which was to depopulate the rural landscape. In the process, he casts doubts on the viability of using an ethnohistorically documented indigenous social structure of nested hierarchies as an analog for Tiwanaku political and social organization (Albarracín-Jordán 1996a), thus lending credence to models of a more centralized and powerful state (Kolata 1993; Stanish 2003).

Contributions from this and the previous volume indicate that the period immediately after the collapse of Tiwanaku was a time of reorganization, migration, and conflict; however, it was not necessarily a basin-wide demographic collapse. Although uninterested in erecting public architecture at the scale of their predecessor, the small kingdoms or competing chiefdoms that developed after the collapse of Tiwanaku were sufficiently strong and astute to resist initial Inca and Spanish incursions (Frye and de la Vega 2005; Stanish 2003). A series of strategies of internal migrations and continuous litigation with their colonial overlords allowed these highland populations to survive (Bandy and Janusek 2005).

One of the areas that appears to have experienced a demographic rise during this period is the Jesús de Machaca valley, where Jennifer

Zovar (chapter 6) investigates a large and dense hilltop settlement overlooking the Formative period monumental site of Khonkho Wankane. Pukara de Khonkho commands a naturally fortified position but lacks walls, towers, and parapets. The site itself presents a dense pattern of habitation, burials, and, toward the summit, open spaces and apparently large empty buildings. This type of settlement falls outside the typologies listed by Elizabeth Arkush and Charles Stanish (2005) for the northern basin. Zovar attributes these dissimilarities to either a social and political dynamic unique to the southern basin or to a migrant group that did things somewhat differently from the rest of its altiplano neighbors.

OSTEOLOGY

Christina Torres-Rouff (chapter 14) addresses the important topic of the changing composition and identity of the basin population through her analysis of three collections of crania brought back to the American Museum of Natural History by Adolph Bandelier during his research on the Island of the Sun and from a more distant location (Kupa Pukio Chullpa and Tama Tam Chullpa) southeast of the capital of La Paz. Although these periods were separated both geographically and temporally (Formative period versus Late Intermediate period), Torres-Rouff considers similar annular cranial modification to be an indicator of a shared pan-altiplano identity. She also finds regional differences related to conflict and community. The Island of the Sun, at times the most sacred place in the Andes (Bauer and Stanish 2001), had a population characterized by a high degree of nonlethal cranial trauma. Torres-Rouff suggests that the cause of this pattern may be endemic raiding or ritualized face-to-face confrontations (Tinku), which were documented by Bandelier, in which wounding, not death, was the goal.

John Verano (chapter 13) presents the results of an unusual find of sacrificed and reinterred individuals within the monumental core of Tiwanaku. Although sacrifice and decapitation are prevalent in Tiwanaku imagery, this discovery is the first evidence at Tiwanaku of violence perpetuated on live individuals (previous dismemberments appear to have been on mummy bundles). A heterogeneous mix of sex and age, articulated and disarticulated, and primary and secondary, the remains do not fit previous patterns noted at Tiwanaku (Blom, Janusek, and Buikstra 2003). The individuals also had a variety of head modifications, additional evidence for the claim that the population of Tiwanaku was characterized by ethnic diversity, including groups originating outside the altiplano.

MATERIAL STUDIES

A preoccupation with monumental space has a tendency to focus our interests on the smallest and most elite class of individuals. One of the major contributions of Proyecto Arqueológico Taraco has been to teach to an entire generation of scholars both the value of and the methods for conducting analysis of the smallest and least spectacular of archaeological remains. An alumnus of this group is José Capriles (chapter 9), who complements the usual emphasis on the intensification of agriculture or camelids with an analysis of piscine materials from the lakeshore site of Iwawi (Proyecto Arqueológico Iwawi, 1993 and 1996). He suggests two different scenarios for the reduction of the size of the fish over time: either the local resources were being overexploited, or the larger fish were being exported and smaller fish consumed locally. Each plausible scenario shows how even a distant and simple fishing lifestyle becomes transformed when a large entity such as Tiwanaku starts to redirect resources and energies toward itself.

The prevalence of circular structures surrounding the open ritual spaces was one of the most interesting finds from the Khonkho Wankane excavations. As expected, the ritual spaces were clear of artifact remains, but the hidden spaces in between these circular structures presented a dense accumulation of domestic middens similar to other Formative period sites in Taraco (Kala Uyuni), Lukurmata, and Tiwanaku (Kk'araña and Kalasasaya sectors). Sifting through the tossed-out remains of daily lives and communal festivals, Erik Marsh (chapter 4) helps us redirect our thoughts from the sunken courtyards and plazas to the people who lived next to these monuments.

CONCLUSION

Whereas a generation ago the discussion of Tiwanaku would have made continuous reference to the later ethnohistorical period, there is barely a mention of the Incas or other preindustrial states in present-day publications. The turn against the idea that Tiwanaku was a "mini-Inca" state is in part a continent-wide reaction to the previous misuse of ethnographic analogy (Isbell 1995). This trend, combined with the growing repute of theories that emphasize individual and small group agency (Giddens 1984), resulted in the popularity of frameworks that emphasized individual group autonomy and the role of structured negotiation as a means to organize complex society.

The field of archaeology will, by definition, suffer from a paucity of data and will thus be susceptible to theoretical trends and fads; the case of Tiwanaku is particularly severe, due not only to poor preservation but also to its preliterate status. At the moment, the evidence and interpretation from this volume attests to a degree of intentionality by Tiwanaku to affect the lives of those within their immediate sphere of influence, tipping the balance slightly in the direction of a smaller (both in terms of time and space) but more powerful organization that built on the substantial accomplishments of its predecessors. The demographic review by Bandy (chapter 7) for the Tiwanaku valley proposes a depopulated rural landscape later resettled by the Tiwanaku authorities. Possible competitors such as Khonkho Wankane and Lukurmata withered to a fraction of their former size (Smith, chapter 3; Bermann 1994). This evidence, supported by the fact that the Tiwanaku could engage in large-scale and continuous labor-intensive modifications to their capital (Yaeger and Vranich, chapter 11; Koons, chapter 12), lends credence to the idea of the creation of a powerful authority.

Clearly, we have only started to comprehend the strategies and mechanisms that allowed the Titicaca Basin to become a cradle of civilization. Even more puzzling is the manner by which Tiwanaku managed to maintain a firm edifice of unity for several centuries over such a diverse landscape, whereas others who wielded overwhelming coercive force were frustrated by transient power. The discussion fostered by the implications of this issue is far from over; undoubtedly new evidence will contribute to engender more debate and refine our models. In view of the fact that both archaeologists and the general public find polemics an interesting and effective manner with which to frame conflicting and incomplete data, the Titicaca Basin will serve as an excellent springboard for broader discussions of the roles of authority, coercion, and the intensification of resources and trade for the development of archaic states worldwide.

NOTE

1. In this regard, it is important to commend the efforts of pioneers in north Titicaca Basin archaeology such as Manuel Chávez Ballon, Luis Valcarcel, Alfred Kidder, Marion Tschopik, Sergio Chávez, Karen Mohr Chávez, Rolando Paredes, and Elias Mujica.

Chapter 2

Jesús de Machaca before and after Tiwanaku: A Background to Recent Archaeology at Khonkho Wankane and Pukara de Khonkho

John W. Janusek

Throughout the twentieth century, archaeology in the southern Lake Titicaca Basin of the South American Andes centered on the pre-Hispanic city and culture of Tiwanaku. Since the late 1980s, intensive transdisciplinary research has dramatically expanded our knowledge of the chronology, urban character, and ritual-political expansion of the Tiwanaku polity. This research has generated innumerable questions with cross-cultural relevance. These include questions focused on the historical processes that gave rise to Tiwanaku and the processes of disintegration that characterized Tiwanaku's collapse and cultural regeneration. The present and following four chapters bear on these problems by presenting new archaeological research in the Jesús de Machaca region of the southern Lake Titicaca Basin.

This group of chapters presents the preliminary results of archaeological research conducted by members of Proyecto Jach'a Machaca, a large-scale transdisciplinary project that I have directed since 2001. Jesús de Machaca, the geographical focus of the project, occupies a significant portion of the upper Rio Desaguadero valley, a vast area of the Andean altiplano at the southwestern edge of the Lake Titicaca Basin (fig. 2.1). The Rio Desaguadero, Lake Titicaca's primary drainage, meanders through the upper valley and forms a hydraulic axis that links the lake to Lake Poopó, some 260 km farther southeast. Unlike many areas adjacent to Titicaca, the upper Desaguadero is relatively dry. In recent times and for much of the pre-Hispanic past, productive practices distant from the river emphasized pastoral pursuits in the balance of the agropastoral economies that characterize most of the altiplano.

The Machaca region is not only liminal in regard to agricultural production in the Titicaca Basin, it also occupies the northern edge of a "border zone" between pre-Hispanic cultural developments centered in the Titicaca Basin and those centered in the area just north of Lake Poopó. Two macro goals of the project were to understand long-term cultural development in Jesús de Machaca, in regard to its particular ecology and productive regimes, and its place in interaction networks that both differentiated and linked the two cultural zones. To understand social and productive diversity in Machaca, the project initiated research in two regions: a "river zone" focused on the site of Iruhito on the edge of the Desaguadero, and an "inland zone" some 30 km to the east focused on the sites of Khonkho Wankane and Pukara de Khonkho. The present paper and following chapters present initial results in the latter.

Research in the inland zone, which centers on the contemporary community of Qhunqhu Liqiliqi, revealed occupations dating from the Middle Formative (800–200 BC) through the Early Colonial period (AD 1535–72). The two principal sites in the region are Khonkho Wankane and Pukara de Khonkho. Each site provides rich evidence for human occupation during one of the periods that bookended Tiwanaku's hegemonic apogee during the Andean Middle Horizon (AD 500–1100). Each site served as an important

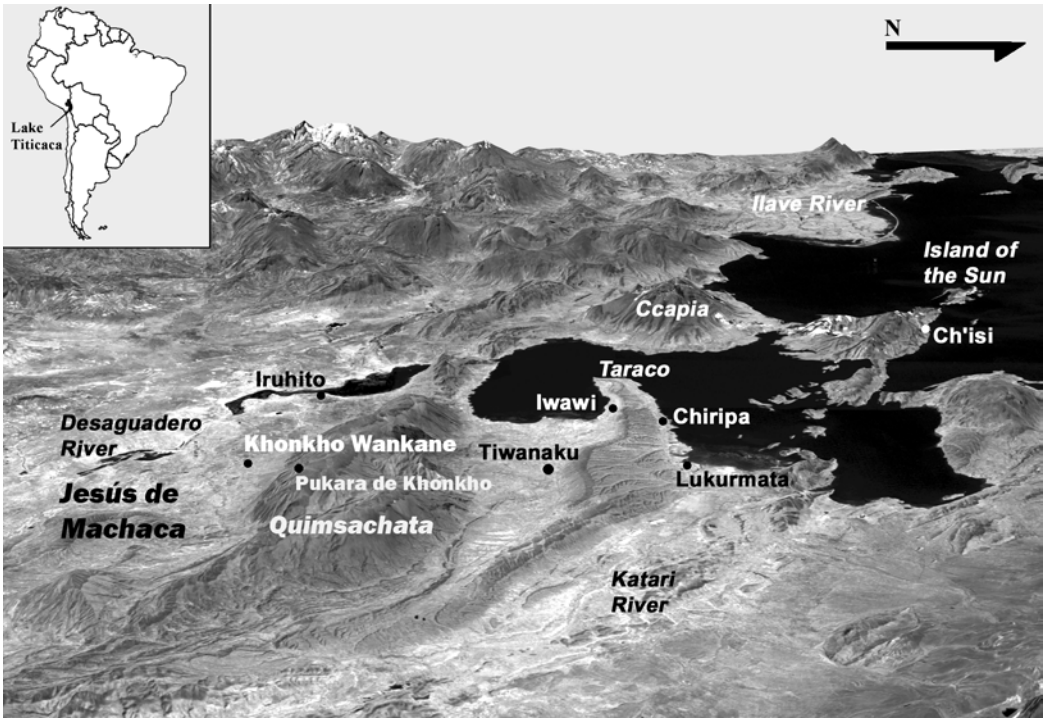

FIGURE 2.1 The southern Lake Titicaca Basin. The Jesús de Machaca region is to the left. *Base map courtesy of Arik Ohnstad.*

regional center during its respective period; Khonkho Wankane served as a ritual-political center during the Late Formative period that preceded Tiwanaku's emergence (100 BC–AD 500), and Pukara de Khonkho served as a demographic center during the post-Tiwanaku Late Intermediate period (AD 1100–1450). Our archaeological research at these two sites adds greatly to current knowledge of long-term sociopolitical transformations in the south-central Andes, specifically—though not exclusively—as they relate to the emergence and subsequent disintegration of Tiwanaku culture.

This chapter provides a background for the following chapters and, broadly, for the preliminary results of our research in the Jesús de Machaca region of the Bolivian Andes. In the following sections I outline a history of archaeological research and interpretation of Khonkho Wankane and Pukara de Khonkho. Past interpretation of both sites has been inflected by what Alconini Mújica (1991) terms a Bolivian "monumentalist" archaeological perspective of the pre-Hispanic past. Such a perspective has directed research at a handful of Bolivian archaeological sites, most prominently Tiwanaku and other sites interpreted as Tiwanaku regional centers. Khonkho Wankane entered the crosshairs of Bolivian national archaeology during the 1930s because of its towering sandstone monoliths and its presumed connection to Tiwanaku. Pukara de Khonkho was systematically ignored by most Bolivian archaeologists because of its post-Tiwanaku temporal position and lack of monumental features. The site embodied the decline of pre-Hispanic civilization. In very different ways, attention to both sites was heavily influenced by a predominant nationalistic ideology of the pre-Hispanic past that crystallized in Bolivia during the 1950s in the course of one of Latin America's most dramatic agrarian reforms. Understanding this volatile ideological history helps us to contextualize the predominant assumptions and logics that dictated the production of archaeological knowledge—largely unquestioned as knowledge of Bolivia's glorious national past—during the latter half of the twentieth century.

I first outline a history of research for Khonkho Wankane. The site is located on a modified alluvial formation of the Rio Desaguadero valley beneath the foothills of the Quimsachata-Chilla

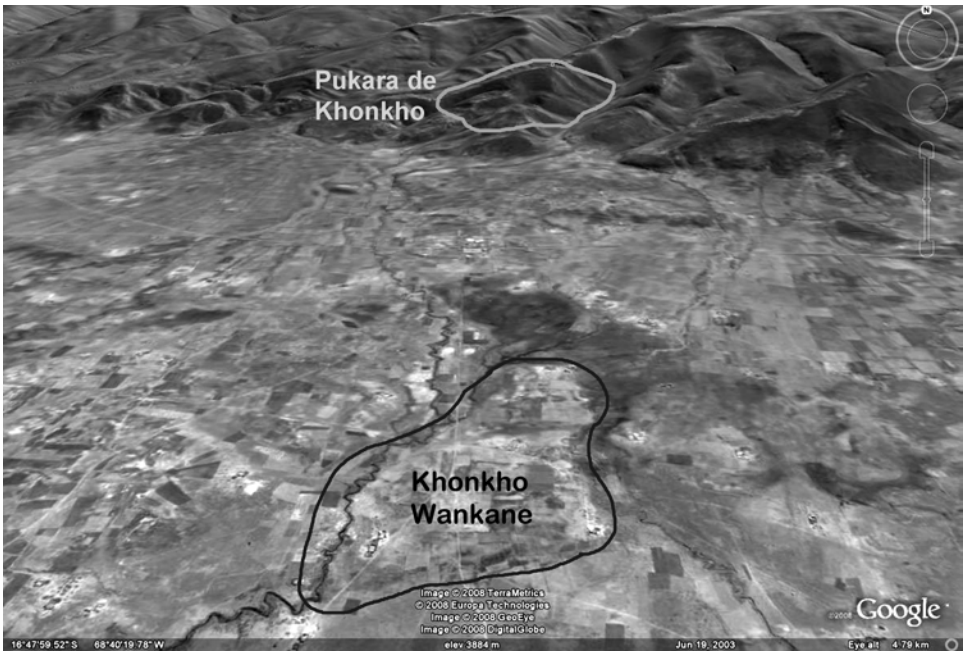

FIGURE 2.2 The location of Khonkho Wankane and Pukara de Khonkho in the Jesús de Machaca landscape. *Image courtesy of Google Earth.*

range (fig. 2.2), some 25 km directly south of Tiwanaku. I then outline a brief history of research for Pukara de Khonkho, located in the mountainous landscape directly north of Khonkho Wankane and at the southern edge of the Quimsachata-Chilla range. During the early mid-twentieth century, both sites were subjects of empirical archaeological research that demonstrated non-Tiwanaku chronological and social affiliations, respectively, pre- and post-Tiwanaku. By the 1990s, Khonkho Wankane was considered a secondary regional center and Jesús de Machaca a key sustaining hinterland of the Tiwanaku state. Yet, Proyecto Jach'a Machaca demonstrated that Khonkho Wankane peaked as a center during the Late Formative, while Pukara de Khonkho was occupied during the latter half of the Late Intermediate period. Neither was particularly significant during Tiwanaku hegemony. In later sections I describe a history of research that has come to terms with this conclusion while contextualizing results of archaeological research presented in the chapters that follow.

KHONKHO WANKANE

Recently, formative sociopolitical development in the Lake Titicaca Basin has become a central focus of Andean archaeological inquiry. Research in the southern basin over the past two decades has sharpened our understanding of the social processes and temporal rhythms of emergent complexity in this vital pre-Hispanic region. Archaeologists are just beginning to understand the sociopolitical and human-environmental transformations that gave rise to the Tiwanaku city and polity after AD 500. Initiated in 2001, Proyecto Jach'a Machaca is one of a few large-scale projects that set out to understand Formative period developments in the southern basin. It was also one of the few that sought to understand processes of community reformulation and sociopolitical reconstitution in the course of Tiwanaku state collapse.

Khonkho Wankane occupies a portion of the Jesús de Machaca pampa between the foothills of the Quimsachata-Chilla range and the Rio Grande (Jach'a Jawira), a tributary of the Rio Desaguadero. It consists of two mounds surrounded by several smaller knolls (fig. 2.3). The Wankane Platform—which housed Khonkho's monumental complex—was artificially raised over a natural hillock. Today, a person can easily discern the foundations of several architectural enclosures on Wankane and will notice that the mound is punctuated by three eroded earthen platforms that surround the east, west, and south sides of an extensive central plaza. Long before archaeologists discovered the site, local Aymara groups had been curating and venerating three sculpted but heavily eroded monoliths, and much of a fourth was found in 1941 (see below). The sides of the Wankane Platform are bounded by two streams that drain water from semipermanent springs in

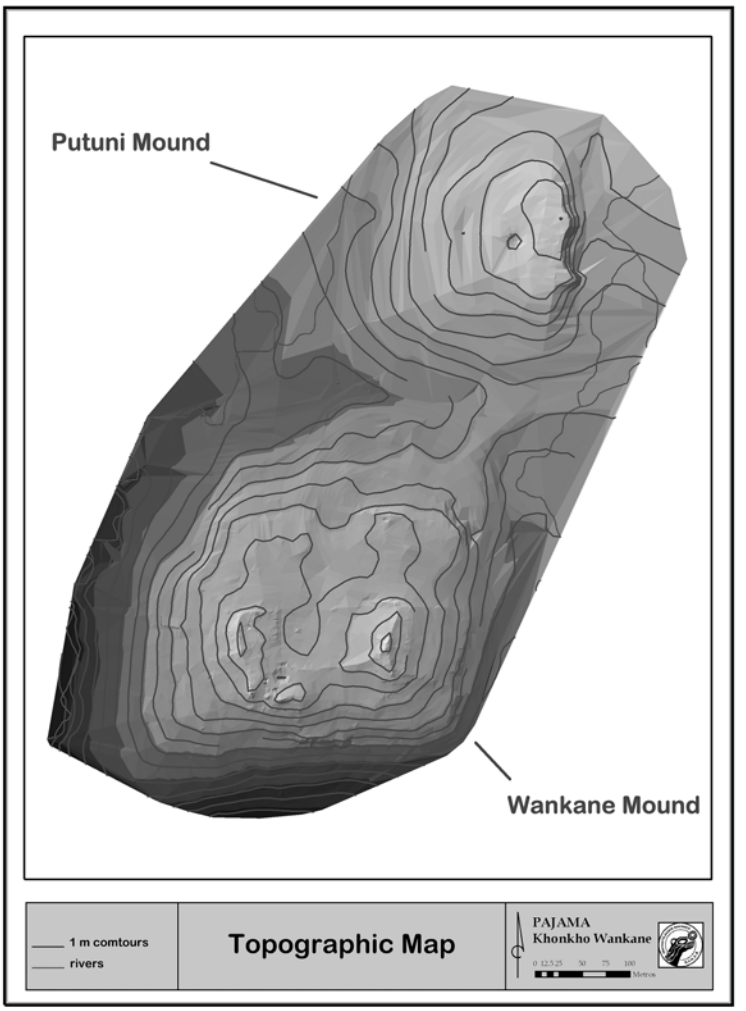

FIGURE 2.3 The two mounds of Khonkho Wankane: Wankane and Putuni. *Base map courtesy of Scott Smith.*

the Quimsachata-Chilla foothills to the Rio Grande. Marshes surround the north and south edges of the platform, remnants of artificial ditches that were frequently inundated in the past. North and slightly east of the bounded platform is the Putuni Mound, a natural hillock that was converted into a monumental platform sometime later than was Wankane. These two mounds comprised Khonkho Wankane's core.

It is remarkable that so little research had been conducted at Khonkho Wankane prior to Proyecto Jach'a Machaca's inception. Apparently, the site had been curated and revered by inhabitants of Qhunqhu Liqiliqi and, perhaps, the more encompassing Jesús de Machaca community for centuries. Nevertheless, there is no known mention of the ruins until the twentieth century (Portugal Zamora 1955, 51). The archaeological history of the site begins with a denouncement published in a local periodical by a citizen of Guaqui, a large town en route to the site from the Tiwanaku valley (Sagárnaga Meneses 1987). The article decried illicit excavations by a certain Valentín López de Diego (Portugal Ortiz 1998, 117; Rydén 1947, 89). Fritz Buck (1937, 183) notes that López "discovered" the site early in 1936. Yet, Jedu Sagárnaga Meneses (1987, 46) cites a document (Anonymous 1936) that names Buck himself in collaboration with López in disturbing the site and breaking in half one of its primary monoliths (fig. 2.4). Khonkho's archaeological history was off to a rocky start.

Later that same year, Maks Portugal Zamora, then director of the Museo Nacional de La Paz, published a brief description of the site and its monoliths in the La Paz paper, *La Razón*. In November 1937, Alfredo Peñaranda, head of the Bolivian Ministry of Education and Indigenous Affairs, organized the first archaeological commission to investigate the site and its zone. Head-

FIGURE 2.4 The archaeological "commission" to Khonkho Wankane, 1936: Maks Portugal Zamora (*center*), accompanied by Fritz Buck (*left*) and Guillermo Mariaca (*right*), standing by the Jinchun Kala monolith (Buck 1937).

ing the project was Portugal Zamora, accompanied by Fritz Buck and Guillermo Mariaca (Anonymous 1936). As a result of this commission, Khonkho Wankane became the second archaeological site to be registered in Bolivia.

Maks Portugal Zamora: Founder of Archaeology at Khonkho Wankane

Portugal Zamora excavated at Khonkho Wankane between 1937 and 1941 (Portugal Zamora 1941, 1955; Rydén 1947). He was the first to describe its elaborately carved monoliths: the Jinchun Kala, Wila Kala, and Tata Kala—located in situ in the site's central plaza—and he unearthed what Proyecto Jach'a Machaca has christened the "Portugal Monolith" (see Ohnstad, chapter 5). He notes that the aforementioned commission excavated twelve randomly placed units, the first eight of which "did not yield the desired results" (1941, 297). It is unclear what that "desire" was, though we can speculate that Portugal sought to find another monolith. Precociously, and based on monolithic iconography, Portugal Zamora concluded that Khonkho Wankane dated to a "primitive" pre-Tiwanaku epoch.

Working in the area of Khonkho Wankane's East Platform, Portugal Zamora (1955) encountered at least three structure foundations in his excavations, two of them rectilinear and one semicircular. The semicircular foundation abutted one of the rectilinear walls (fig. 2.5). Associated with them were "dispersed materials of stone, some worked, and camelid bone" (Portugal Zamora 1955, 62). Based on associated artifacts, we can date this occupation to the Late Formative period, while the second rectilinear foundation dates to the Tiwanaku period.

Portugal Zamora encountered two cist tombs associated with the Late Formative occupations, in both of which metal adornments were particularly notable. Even now, these are two of the best-described Late Formative burials known from the southern Lake Titicaca Basin. The first, Tomb A, contained what he considered a local "authority" (Portugal Zamora 1955, 62). The person had been interred wearing a necklace of pendant bronze stars, a bronze pectoral in the form of a circle, and

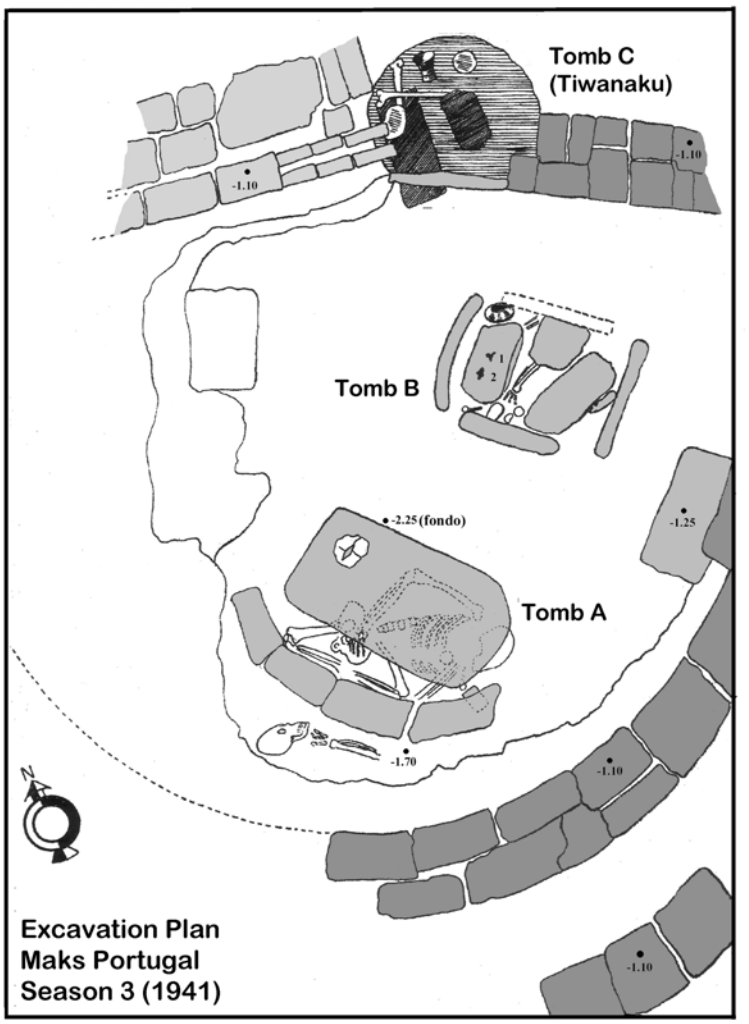

FIGURE 2.5 Plan of structure foundations, burials, and features excavated by Maks Portugal Zamora in the East Platform of Khonkho Wankane, 1941 (*adapted from Portugal Zamora 1955*).

a bronze pin. The person also wore a bronze labret, or chin ornament. S/he had been covered with burnt vegetation before the tomb was covered with a capstone. Less than a meter away was Tomb B (Portugal Zamora 1955, 64–65). Most of its human remains had disintegrated. The only remnant part of the cranium, the frontal bone, had been covered with red ocher. Like the interred person in Tomb A, this person had been buried wearing a bronze labrette. His/her right arm extended toward a cache of offerings that included a circular bronze pendant, pin, and necklace of bronze adornments joined by a piece of gold lamina.

Portugal Zamora encountered three tombs dating to the Tiwanaku period. All of them included Tiwanaku-style vessels as burial offerings, and one included a camelid-effigy *incensario* (Portugal Zamora 1955, 66). He concluded that these burials postdated the monoliths encountered at the site. In a posthumous publication (Portugal Zamora 1988, 16), he refined this position. According to Max Portugal Ortiz, Portugal Zamora's son, his father had hypothesized that Khonkho Wankane was inhabited by a society "with clear class divisions." The use of red sandstone in Khonkho Wankane's architecture and monoliths, he continued, identifies the site as part of the "Pa-Ajanu" stone sculptural style. Portugal Zamora considered Pa-Ajanu to date to the "Qeya period," what we now term Late Formative 2 (AD 250–500). Following predominant trends in Bolivian archaeology, he interpreted this style as representing Tiwanaku's early, "proto-urban" expansion. Essentially correct in its temporality, his interpretation was disregarded until very recently.

A Nordic Touch: Stig Rydén at Khonkho Wankane

Not long after Bolivian authorities encountered Khonkho Wankane, a Swedish archaeologist was invited to help with its excavation. Stig Rydén (1947, 82) arrived in Machaca toward the end of 1938, after having finished his oft-cited excavations and ceramic analyses in Tiwanaku. Machaca was more closely aligned with his primary interest in South America, which was to study the "Chullpa graves" of the Bolivian highlands (1947, 11). Rydén took photos, made drawings, conducted surface collections, analyzed monolith iconography, and excavated twelve pits at Khonkho Wankane. He was the first to conduct excavations on the "knoll" north of the main Wankane Mound, what we term the Putuni Mound.

Rydén noted that Khonkho Wankane is bounded to the east and west by natural ravines fed by mountain springs to the north. Based on still-visible outlines of upright stone slabs, he (1947, 82) considered Khonkho Wankane "a smaller-scale counterpart of Kalasasaya at Tiahuanacu" (fig. 2.6a). Based largely on surface features, Rydén considered the Wankane Mound to consist of "three rectangular courtyards" (1947, 86). The largest was the NE courtyard, what we now term the Main Plaza; bounding its west side was the NW courtyard, what we now term the Dual Court Complex; and on the south side of both was the S courtyard, our trapezoidal Sunken Temple (1947, 86–89).

On the Wankane Mound, Rydén excavated one unit inside of the Main Plaza (pit 6), one unit in its East Platform (pit 7), one unit on the west slope of the mound (pit 4), three units in the northwest quadrant of the mound (pits 3, 5, and 8), and two units in post-Tiwanaku tombs on the south side of the West Platform (pits 1 and 2; fig. 2.6b). Although Rydén recovered ceramic sherds representing a variety of styles and forms, including styles we now know date to the Late Formative, he was struck by the presence of "Decadent" Tiwanaku and smaller amounts of post-Tiwanaku pottery in several pits.

Rydén (1947, 154) concluded that Khonkho Wankane was first occupied during what we now term Tiwanaku V (AD 800–1100) and continued to be occupied into post-Tiwanaku times. Thus, his conclusions were quite different from those of Maks Portugal Zamora. Rydén (1947, 153) based his interpretations on Khonkho Wankane's "architectural style, the excavated finds, the monoliths adjoining the ruins, and, to some extent, the character of the graves." With regard to the architecture, Rydén (1947, 154) considered the courtyards similar to those of the Kalasasaya at Tiwanaku but noted that at Khonkho Wankane the stones were smaller, and the structures "impress one as being poorer and more degenerate." Rydén interpreted the Jinchun Kala and Wila Kala monoliths as "Decadent" Tiwanaku rather than pre-Tiwanaku sculptures (1947, 164). In this he followed Wendell Bennett's (1934) inaccurate and late chronological designation for the "Bearded Monolith" in the Sunken Temple at Tiwanaku. Summarizing his own observations, Rydén concluded that the Late Formative, or what was then known as "Early Tiahuanaco," was "altogether unrepresented" at Khonkho Wankane (1947, 154).

Khonkho Wankane as Tiwanaku City and Bolivian Cultural Patrimony: 1950–87

After the early work of Portugal Zamora and Rydén, Khonkho Wankane fell off the archaeological radar as quickly as it had appeared. Excavations occurred over the following half-century, but little aside from Portugal Zamora's second and last article on the site (1955) was published. It was in the 1950s, after a left-led Bolivian agrarian reform, that research at Tiwanaku began in earnest and that the site was interpreted by a new generation of archaeologists as the primary historical anchor for the cultural patrimony of a newly reconfigured, progressive nation. In part because of this, and despite Portugal Zamora's precocious ideas to the contrary, Rydén's interpretation of Khonkho Wankane as a Tiwanaku period center would hold until the end of the twentieth century. During this time, Khonkho Wankane crystallized in international archaeological consciousness as a regional Tiwanaku center and, at least in some circles, Tiwanaku's "second city."

The formation of the Center of Archaeological Investigations in Tiwanaku (CIAT) in 1957 instituted a brave new world of Bolivian archaeology

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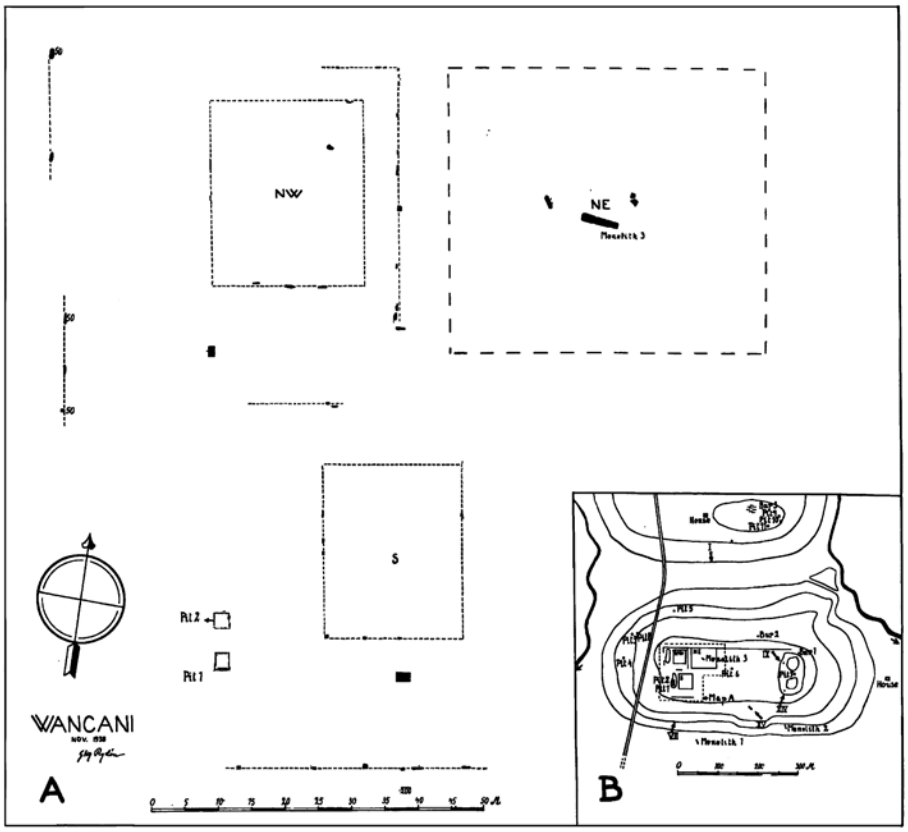

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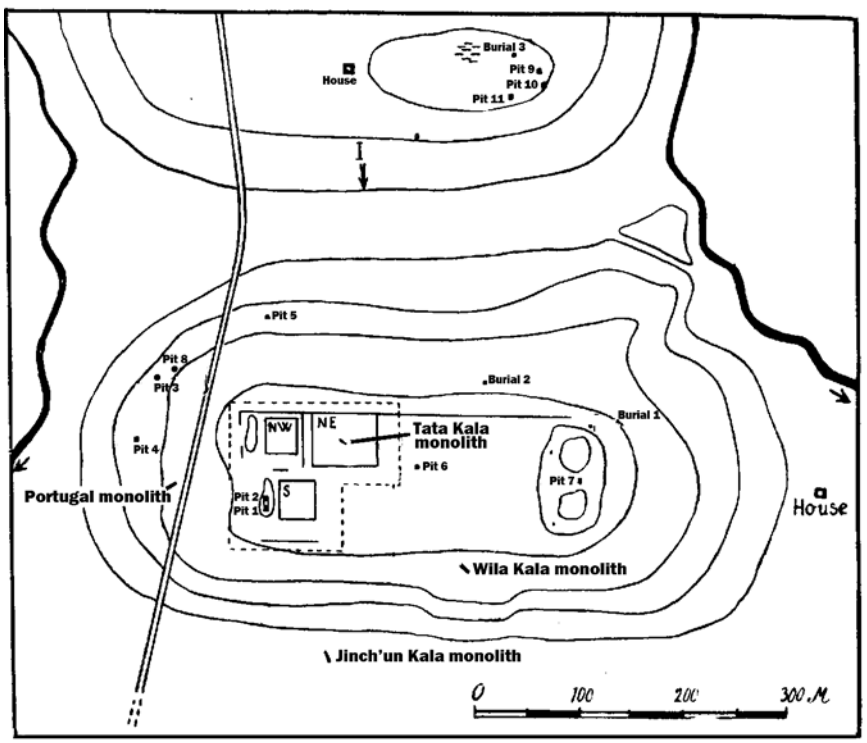

FIGURE 2.6 (*a*) Map of key architectural features of the Wankane mound, according to Stig Rydén (1947), and (*b*) the location of excavated pits, burials, and then-known monoliths, *after Portugal Zamora 1955*.

founded on nationalist principles and dedicated to a scientific—and at times "scientistic"—archaeological agenda (Ponce Sanginés 1995, etc.). The "mover and shaker" behind the agenda was Carlos Ponce Sanginés. Two of his star associates were Portugal Zamora and Gregorio Cordero Miranda. Of the former, the pioneer of Khonkho Wankane archaeology, Ponce Sanginés notes in an exhaustive history of Tiwanaku research: "Maks Portugal Zamora (1906–1984) as an archaeologist represents the transition between the early and institutional stages of Bolivian archaeology" (Ponce Sanginés 1995, 280). Following quickly on the heels of a swift and effective state agrarian reform and political revolt, Ponce Sanginés's archaeological revolution reinterpreted Tiwanaku as Bolivia's cultural patrimony. In his view, all of significance in Bolivia's pre-Hispanic past was in some way linked to Tiwanaku state development or military-political control. Khonkho Wankane was no exception. Rydén's chronology, rather than Portugal Zamora's—the intellectual "marginal man" of Bolivian archaeology—meshed better with this nationalist ideology.

Concentrating his research efforts on Tiwanaku monuments, Ponce Sanginés never excavated at Khonkho Wankane. Nevertheless, he compared its monolithic iconography with that of monoliths with similar characteristics from Tiwanaku (Ponce Sanginés 1990). Following Portugal Zamora and in contrast to Rydén and Bennett, he noted that Khonkho Wankane's monoliths corresponded with an early style also found within Tiwanaku's Semisubterranean Temple. Further, Cordero Miranda, a critical player in the new regime and by all accounts an excellent field archaeologist, at some point excavated at Khonkho Wankane. According to Alejandro Colmena, the long-standing official native guardian of the ruins, Cordero excavated a couple of units in our sector 3, in the northwest corner of the site and just west of the main Wankane platform. His notes have yet to be tracked down and published.

Through thousands of pages of publications and forceful, charismatic lectures and speeches, Ponce Sanginés appropriated Khonkho Wankane to the chosen political and cultural *Wunderkind* of Tiwanaku. According to him, Khonkho Wankane was a pre-Hispanic urban center, and its urban character had everything to do with Tiwanaku (Ponce Sanginés 1980, 1981). As he elaborates (1980, 36; see also 1995, 157), Tiwanaku's "urban regimen was concentrated exclusively in the nucleus of its culture, and includes the city of Tiwanaku itself, as well as Wankani [*sic*, Khonkho Wankane], Lukurmata, and Pajchiri." Ponce Sanginés considered Tiwanaku an urban society, a civilization in V. Gordon Childe's sense of the term, even if limited to just a few urban centers, all within the "heart of the aforementioned culture" (Ponce Sanginés 1980, 36).

The same Tiwanaku-centric view of Khonkho Wankane was taken up by Alan Kolata during the 1980s and 1990s. His research in Bolivia began as a relatively small-scale study of raised fields, their productivity, and their social organization in 1978–82. In 1986, Kolata directed large-scale excavations as head of Proyecto Wila Jawira at one of Ponce Sanginés's proposed urban centers, Lukurmata (Kolata 1989; Ponce Sanginés 1989). Systematic mapping, surface collection, excavations, and artifact analyses, in addition to abundant specialized regional paleoarchaeological analyses, indicated that Lukurmata was a major Tiwanaku-phase urban settlement of great extent and substantial population (Bermann 1994; Janusek 2004b; Stanish 1989). It remained to do the same for some of the other centers that Ponce Sanginés had claimed to be Tiwanaku urban centers.

Kolata directed excavations at Khonkho Wankane in November 1987. Taking an extensive page from Ponce Sanginés's interpretive framework, Kolata (1987, 264) sought to investigate Khonkho Wankane in order to understand the "Tiwanaku Regional Settlement System." He conceptualized the 1987 field season as one that would intensively investigate the "Tiwanaku sustaining area" (1987, 265). For Kolata, and following Ponce Sanginés, Khonkho Wankane was one of three principal secondary urban centers, along with Lukurmata and Pajchiri. Kolata writes of his proposed research:

> Khonkho Wancane [sic], like its northern counterparts, Lukurmata and Pajchiri, possesses an impressive core of civic-ceremonial architecture. In the case of Khonkho Wankane, this architecture takes the form of

> massive, terraced platform mounds surmounted by an ensemble of cut stone constructions. . . . Preliminary, qualitative assessment suggests that the labor investment in public construction at Khonkho Wankane surpasses that at either Lukurmata or Pajchiri (Kolata 1987, 267–68).

Embellishing Ponce Sanginés's interpretation in theoretical terms, Kolata (1993, 103) interpreted Khonkho Wankane as one of Tiwanaku's secondary or "satellite cities." According to Kolata (1993, 174), Khonkho would have housed perhaps ten thousand inhabitants, and most people would have lived in outlying villages and hamlets, herding, farming, and fishing. For Kolata, not just urbanism but also its cosmological symbolism was transferred from Tiwanaku to Pajchiri, Lukurmata, and Khonkho Wankane (Kolata 1993, 131). In Tiwanaku, according to Kolata (1993, 131), a canal or moat carved "the urban landscape into a ceremonial core of temples and elite residences within an island enceinte counterposed against extensive sectors of vernacular architecture." This "symbolically dense architectural arrangement was extended to regional Tiwanaku capitals such as Lukurmata, Pajchiri, and Khonko Wankane [*sic*] as a self-conscious emblem of Tiwanaku dominion and legitimacy" (Kolata 1993, 131). Over the following two decades, it became common, even customary, to think, speak, and write about Khonkho Wankane as a Tiwanaku regional center or even as Tiwanaku's "second city."

Nevertheless, the overall style of Khonkho Wankane's monoliths remained a nagging conundrum. Like Portugal Zamora, Dick Edgar Ibarra Grasso considered Khonkho Wankane part of a "Tiwanaku III" or Late Formative 2 culture contemporaneous with the Sunken Temple at Tiwanaku and the site of Kallamarka in the Tiwanaku valley (Ibarra Grasso and Querejazu Lewis 1986, 184). Ironically, early in his career, Ponce Sanginés (1964, 63) also considered Khonkho Wankane a Tiwanaku III center. Later, Portugal Ortiz (1988, 112) conducted regional reconnaissance around Khonkho and undertook surface collections at the site. He acknowledged that his father had considered Khonkho Wankane's monoliths to date to pre-Classic Tiwanaku but also that his excavations in the monumental core had proven the existence of Classic Tiwanaku culture at the site. Surface collections, he notes, produced ceramic fragments diagnostic of late Tiwanaku ("Tiwanaku Expansivo") and Inca phases. By the time Portugal Ortiz wrote his opus on pre-Hispanic Bolivian stone sculptures (1998, 117–31), his own position had coalesced. He isolated Khonkho Wankane's monoliths as prime examples of the early Pa-Ajanu style, which characterized early occupations at sites such as Arapa, in Peru, and Tiwanaku, in Bolivia. This style, he notes, pre-dated Tiwanaku expansion.

Regardless of interpretive discrepancies, Bolivian authorities and archaeologists have for decades realized Khonkho Wankane's importance in regional pre-Hispanic cultural development. In an official Bolivian publication that formalizes the rules and procedures for archaeological excavations in the country (Secretaría Nacional de Cultura 1997, 17), Khonkho Wankane is listed as a national monument, in fact, the second to be officially decreed as such (on July 10, 1936), only after Tiwanaku itself (on November 11, 1909). Sixty-five years and a new millennium later, intensive interdisciplinary archaeological research would commence at Khonkho Wankane.

PUKARA DE KHONKHO

Pukara de Khonkho is located approximately 4 km north of Khonkho Wankane and covers a mountainous landscape at the southern edge of the Quimsachata-Chilla range (~4100–4300 m.a.s.l.). The site is punctuated by two peaks, respectively the Jach'a (large) and Jisk'a (small) Pukara, and it extends across several artificial terraces that stretch down around their slopes (fig. 2.7). Occupational remains include a series of artificial terraces that form concentric rings around the Jach'a Pukara. Associated with the terraces are the remnant foundations of over five hundred circular structures ranging from 1.5 to 3 m in diameter, and at least two hundred retaining walls. Structures, terraces, and retaining walls are particularly dense on the southern slope of the Jach'a Pukara, facing the expansive Jach'a Jawira pampa and the by-then ancient site of Khonkho Wankane (Zovar 2012).

High-altitude sites such as Pukara are usually interpreted as fortified hilltop settlements dating

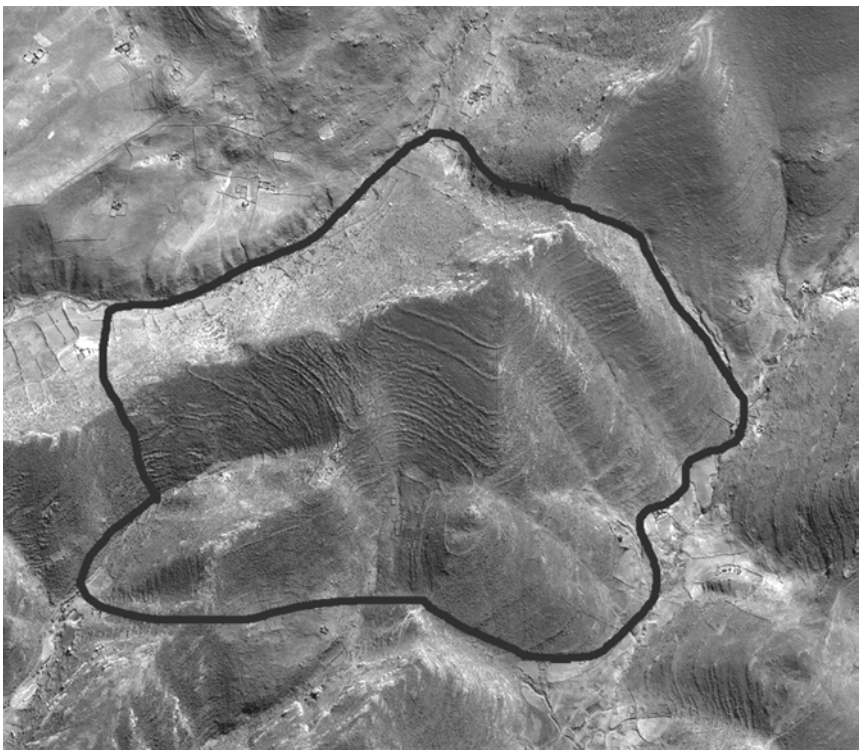

FIGURE 2.7 Aerial view of Pukara de Khonkho. Note the terraces.

to the post-Tiwanaku Pacajes period (or Late Intermediate period), which is considered by many archaeologists a time of chronic interregional conflict. While there are no apparent defensive walls at Pukara, as there are at many hilltop sites in the southern and western Lake Titicaca Basin, its hilltop location and commanding view of the vast Rio Desaguadero valley emphasize its effective defensibility. What stands out about Pukara de Khonkho, though, is the density of its residential architecture, an uncommon pattern at comparable Pacajes hilltop sites. This pattern alone suggests that the site was important and is potentially critical for understanding post-Tiwanaku socio-political developments in the region.

The first, and possibly the only archaeologist to work at the site before we initiated research in 2005 was Stig Rydén. While community members suggest that either Portugal Zamora or Portugal Ortiz conducted some work there, I have not been able to verify this, and they left no published record or report of that work. By all accounts, Rydén (1947, 11) was far more interested in Pukara de Khonkho than Khonkho Wankane. In his travel to Bolivia in 1938 his "main object was archaeological study with particular reference to 'Chullpa graves' in the Bolivian highland," which date to the post-Tiwanaku "Colla" culture. In fact, Pukara de Khonkho was one of several post-Tiwanaku sites that Rydén excavated in the immediate vicinity, which also included the Inca and Early Colonial site of Cchaucha de Kula Marka in the lower foothills directly below and south of Pukara de Khonkho.

Rydén's conclusions about Pukara de Khonkho were accurate, and his interest in it, was precocious. He collected ceramic sherds and excavated two circular structures located on the same terrace on the south face of the site. His excavations yielded numerous ceramic sherds and lithic artifacts. Based on his work, he interpreted the structures as "houses." He interpreted a high incidence of large storage jar fragments in one structure as containers for transporting and storing water. As he pointed out (1947, 291), springs and streams are located well below most of the inhabited areas of the site, and so transporting and storing water near domestic spaces would have been important daily activities. Drawing on rigorous ceramic analyses, he suggested that the site housed a population different from that of other post-Tiwanaku settlements, a distinct "ethnic group," most likely that of the local population that had preceded Inca and Spanish occupation of the region.

The problem of Pukara de Khonkho's past archaeological interpretation differs from that of Khonkho Wankane's. Khonkho was intellectually appropriated to Tiwanaku. Pukara de Khonkho was simply forgotten after Rydén's early incipient research. Before initiating Proyecto Jach'a Machaca, many archaeologists were certain that sites located in the foothills around Khonkho (including Cchaucha de Kula Marka) and nearby hilltops (including Pukara de Khonkho) north of Khonkho Wankane had housed populations affiliated with Khonkho Wankane. In that Khonkho Wankane had been routinely considered a Tiwanaku regional center, this meant that archaeologists had intellectually appropriated all of these sites—which, it turns out, dated to different periods—to an imperial Tiwanaku past. Our research demonstrates that this imperial past is nothing more than a recent mythogenetic rewriting of Bolivia's pre-Hispanic history.

NEW RADIOCARBON MEASUREMENTS AND AN EMERGING CHRONOLOGY FOR JESÚS DE MACHACA

Members of Proyecto Jach'a Machaca conducted archaeological excavation at Khonkho Wankane and its environs between 2001 and 2007 and at Pukara de Khonkho between 2005 and 2008 (Janusek, Ohnstad, and Roddick 2003; fig. 2.8). Project research drew on a full range of methodologies, including full-coverage survey, geophysical prospection, mapping, excavation, laboratory analyses, and specialized chemical, soil, and radiocarbon analyses. This was part of a broader initiative that compared two ecological zones of the Machaca region: an inland zone, where both Khonkho and Pukara are located, and a riverine zone (along the Desaguadero), where we conducted research focused on the large settlement of Iruhito (A. Pérez Arias 2004; M. Pérez

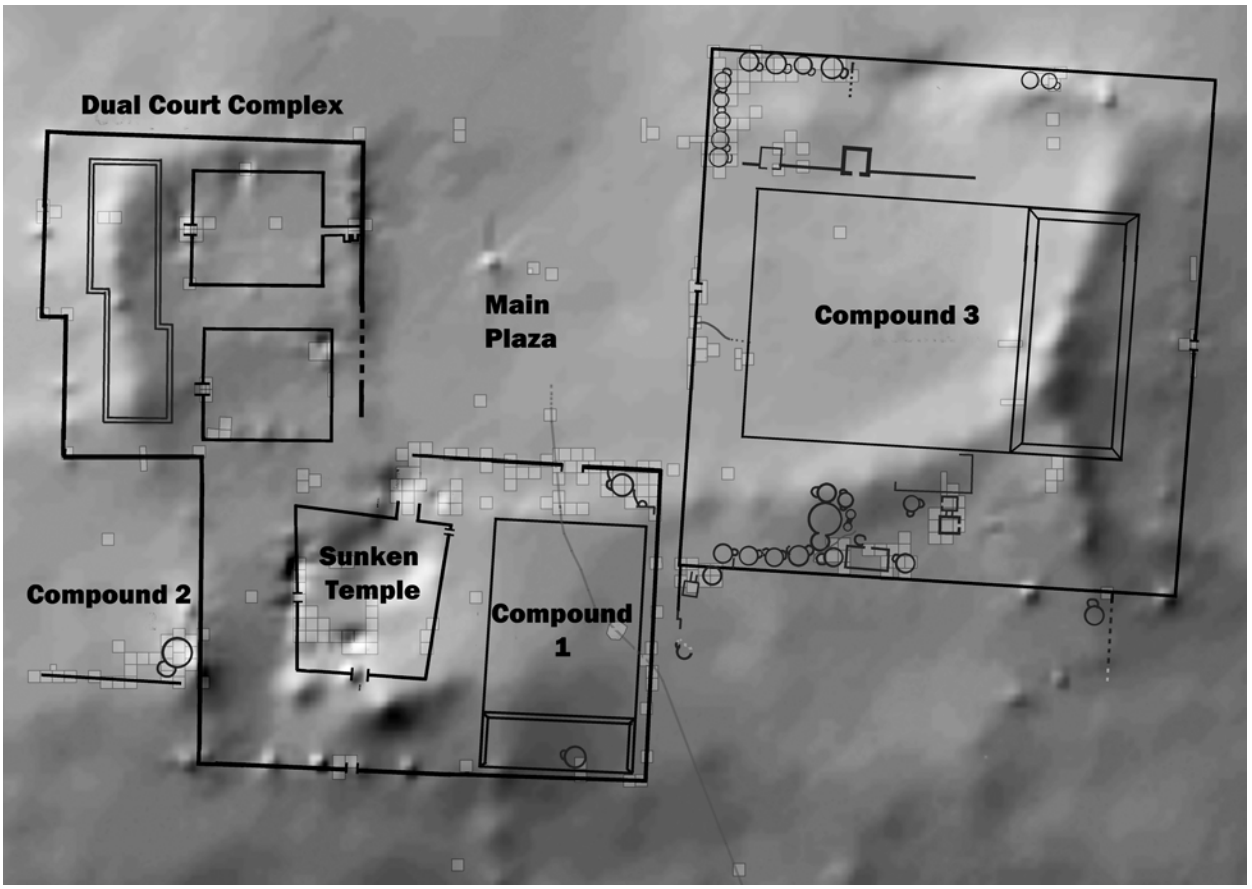

FIGURE 2.8 Key architectural constructions and project excavations on the Wankane mound.

Arias 2005). The results noted here come from radiometric measurements derived from carbon samples taken from excavated, stratigraphically secure contexts at Khonkho Wankane and Pukara de Khonkho. In 2005, we submitted eighteen carbon samples (carbonized wood and camelid dung) to the AMS laboratory at the University of Arizona, including seventeen from Khonkho Wankane and one from Pukara de Khonkho (another twelve from Khonkho Wankane were submitted in 2006, but those results replicate those of the 2005 lot and are not reported here). Samples were taken from secure contexts associated with chronologically sensitive artifacts, largely ceramics but also lithic flakes and other items. At Khonkho Wankane, fourteen samples derived from contexts hypothesized to be Late Formative in age, and three from contexts associated with Tiwanaku materials. Stratigraphic superposition and ceramic analyses allowed us to further subdivide Late Formative into early (Late Formative 1) and late (Late Formative 2) phases (see Bandy 2001; Janusek 2004c; Lémuz Aguirre 2001).

Located on the southern portion of the Wankane platform, a trapezoidal sunken temple and adjacent residential compound (compound 1) yielded evidence for Late Formative 1 occupation (fig. 2.8; table 2.1). Five radiocarbon measurements from surfaces in these two structures yielded a combined calendar interval of approximately AD 120–340 (KW001, KW004, KW005, KW006, KW015), with centroids ranging from AD 155 to 262. Compound 3, the massive compound that occupied the east side of the Wankane Mound, yielded evidence for both Late Formative 1 and 2 occupations. Two radiocarbon dates from a cluster of structures in the southwest quadrant of the compound yielded a total calendar interval of AD 130–340 (KW008, KW010), and two from a residential patio group in the northwest quadrant yielded a total interval of AD 335–430 (KW012, KW013). A burial just south of the compound dated to AD 250–390 (KW0014). Apparently, this compound and its vicinity were occupied throughout the Late Formative period.

Contexts with solid material evidence for Late Formative 2 construction and use included the two sunken surfaces of the Dual Court Complex built into the mound's west platform. The south court yielded a date of AD 260–410 (KW002), and the north court a date of AD 430–550 (KW003). The last date is among the latest obtained from Khonkho and possibly significant in light of evidence for reuse of the north court during the Tiwanaku phase. Two other residential contexts with Late Formative occupations were sampled, one of which yielded a date of AD 260–420 (KW0017), and the other a date of AD 250–390 (KW0011).

We selected three samples from Tiwanaku-phase contexts, all from a residential sector on the north edge of the Wankane Mound and well off of the main Wankane platform. Two were predicted to date to the early phase of Tiwanaku occupation, or Tiwanaku IV (AD 500–800). Accordingly, they provided a combined date of AD 675–780 (KW0007, KW0016). The third was predicted to date to late Tiwanaku, or Tiwanaku V (AD 800–1100) and, accordingly, provided a date of AD 780–970 (KW009). A striking and possibly significant finding is a relatively large gap between the latest Late Formative date (AD 430–550) and the earliest Tiwanaku date (AD 675–775). Although more research will be needed to address this gap, it may point to a hiatus of occupation within that time span. Tiwanaku materials are uncommon on the Wankane platform itself and form scatters that straddle the northern portion of the Wankane Mound and the southern portion of the Putuni Mound. All evidence points to a far less intensive occupation during this period and a severe decline in significance for Khonkho Wankane in general.

Finally, we selected a carbon sample from inside one of two circular structures at Pukara de Khonkho that Jennifer Zovar excavated in 2005 (PU001). This sample yielded a date of AD 1410–55, correlating precisely with Rydén's and our own hypotheses that the site dated to the Early Pacajes phase of human occupation in the region (AD 1100–1450). In fact, the structure appears to date to the end of this phase, just years before (~AD 1450–75) the Inca state conquered and incorporated the Machaca region. The site of Cchaucha de Kula Marka, located on a colluvial platform below and south of Pukara de Khonkho, appears to be the place where local populations resided during the later Inca period.

Table 2.1. Radiocarbon measurements from Khonkho Wankane (n = 18) and Pukara de Khonkho (n = 1) as of 2006

Sample	Site	Unit	Level	Feature	Bag No.	Material	Predicted Phasing	Radiocarbon Age (BP)	Error	95% (<)	95% (>)	68% (<)	68% (>)	Context
KW001	KW	6.61	10		NA	Charcoal	MF	1845	44	60	260	120	240	Occupation midden
KW005	KW	2.43		2	2374	Charcoal	LF1	1696	37	80	350	130	260	Occupation surface above floor
KW008	KW	12.65	3	2	NA	Wood	LF2	1799	38	120	340	130	260	Annex of square structure
KW006	KW	2.43		3	2379	Charcoal	LF1-2	1781	66	80	410	130	340	Floor
KW004	KW	6.37	2		3072	?	LF1-2	1765	38	130	390	220	340	Floor between C-1 and Sunken Temple
KW010	KW	12.81	3	3	NA	?	LF2	1750	38	140	400	230	340	Floor (circular)
KW015	KW	6.47	4		3488	Charcoal in soil matrix	LF1	1738	37	210	410	240	345	Midden in "corridor" east of fogon
KW011	KW	3.11	7		2498	Wood	LF1	1719	38	230	410	250	390	Occupation midden
KW014	KW	7W		1	NA	Charcoal	LF2	1712	37	240	410	250	390	Beneath burial under circular structure
KW002	KW	1.25	2	2	NA	Charcoal	LF2	1696	37	250	420	260	410	Floor
KW017	KW	9.20	4	3	NA	?	LF1/2	1676	37	250	440	260	420	Floor
KW013	KW	7.46	5		NA	Wood	LF2	1655	37	250	540	335	430	Underneath gravel floor outside house
KW012	KW	7.29	2		3	Wood	LF2	1654	37	250	540	335	430	Occupation level outside house
KW003	KW	1.10		2	2471	Charcoal	LF2	1560	37	410	580	430	550	Floor
KW007	KW	4.18		6.2	3182	Charcoal in an ashy matrix	LF2-Tiw 4	1279	37	650	860	675	775	Ash pit
KW016	KW	4.4	2	1	728	Llama dung	Tiw	1261	36	660	870	685	780	Hearth
KW009	KW	4.18	3-4?	1	3142	Wood	Tiw 4	1157	37	770	980	780	970	Ash pit
PU001	Pukara	4.1	3.1	1	NA	?	Pacajes	484	37	1400	1455	1410	1445	Floor

NOTE: Measurements are organized temporally according to their calendar age centroids. Samples were processed by the University of Arizona Accelerator Mass Spectrometry (AMS) Laboratory. Calibrations were processed with OxCal version 4.0.

Our research confirmed some long-suspected ideas and challenged others. Khonkho Wankane reached its apogee during the Late Formative period of the Lake Titicaca Basin (AD 1–500). Based on our radiocarbon measurements, we can tentatively date Late Formative 1 to ~AD 1–300 and Late Formative 2 to ~AD 300–500 (fig. 2.9; table 2.1). The site was occupied throughout the Tiwanaku period (AD 500–1100), yet its occupation and regional significance appear to have declined substantially. Early Pacajes (AD 1100–1450) features and structures have been located at Khonkho Wankane. However, Pukara de Khonkho emerged as a far more densely populated and regionally significant settlement in the mountains north of Khonkho during this period.

CONCLUSIONS

Our research demonstrates that Khonkho Wankane was an important center in the southern Lake Titicaca Basin during the Late Formative period. It first emerged as a ritual-political center during Late Formative 1. Yet it appears that much of the main Wankane platform, which Rydén considered one large "Kalasasaya," was finished during Late Formative 2. Rather than a rectangular Kalasasaya, the ceremonial complex forms a stepped U that encloses a central plaza. Despite a long tradition of archaeologists characterizing Khonkho Wankane as a Tiwanaku regional center, or even Tiwanaku's "second city," occupation during the Tiwanaku period appears far less substantial. Only one structure on the platform, the northernmost court of the Dual Court Complex, may have been in use during this period. Rather, residues of Tiwanaku period occupation straddle the northern portion of the Wankane Mound, outside of the formative ceremonial complex, and the southern portion of the adjacent Putuni Mound.

Surface artifacts and excavated features indicate that Khonkho Wankane continued to be occupied during Early Pacajes, or the local Late Intermediate period. Some of the best evidence for activity during this period comes in the form of small reservoirs (*qochas*) opportunistically excavated into low areas of the site (including one excavated into the Late Formative Sunken Temple). Nevertheless, as Rydén's and our own excavations indicate, the most significant post-Tiwanaku occupations were located in the Quimsachata-Chilla mountains just to the north. In particular, the hilltop site of Pukara de Khonkho became one of the most densely populated settlements in the region during the later generations of Early Pacajes. Zovar (2012) argues that it formed the center of a regional community during these generations. The foothills of the Quimsachata-Chilla mountains became important for human occupation during the Inca and Early Colonial periods and remain the focus of settlement and ritual-political activity to this day.

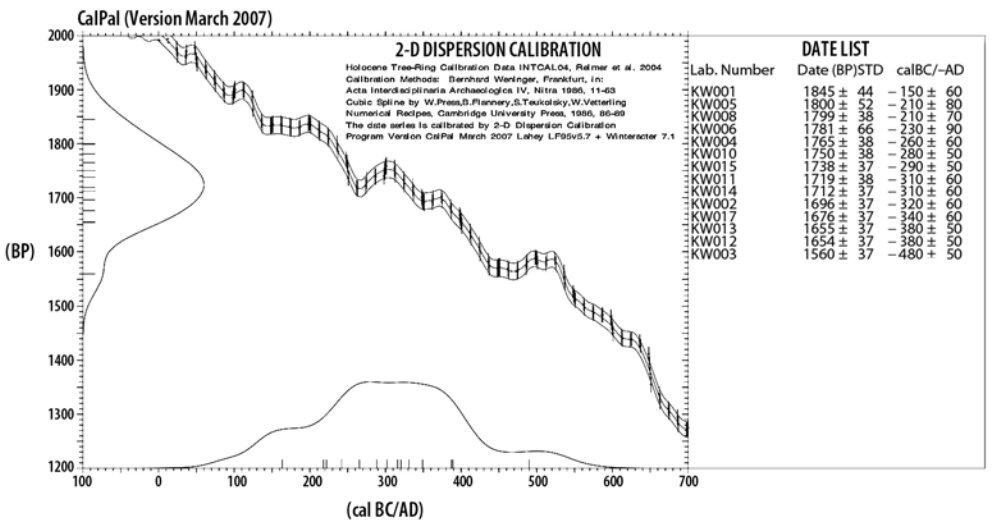

FIGURE 2.9 Dispersion calibration graph of the fourteen Late Formative radiocarbon measurements from Khonkho Wankane. Note the relatively tight range between ~AD 100 and 500. *Chart produced using CalPal version March 2007.*

Despite nationalist and other forms of monumentalist discourse and practice, major cultural innovations preceded and postdated Tiwanaku hegemony in the southern Lake Titicaca Basin. It is now important to study sites such as Khonkho Wankane to understand the processes that gave rise to Tiwanaku ceremonial urbanism and state formation, and sites such as Pukara de Khonkho to understand processes of settlement shift and community reformulation that constituted state disintegration. The following chapters summarize a few of Proyecto Jach'a Machaca's research trajectories toward those ends.

ACKNOWLEDGMENTS

Since I originally wrote this paper in 2007, numerous project theses and publications have been produced. I direct the reader to dissertation theses written by Erik Marsh (2012), Scott Smith (2009), and Jennifer Zovar (2012), and to my own publications that focus on Khonkho Wankane and the Jesús de Machaca region (Janusek 2007, 2012). Research at Khonkho Wankane has been supported by the National Science Foundation (BCS-0514624), the National Geographic Society (7700-04), the Howard Heinz Foundation, the Curtiss T. and Mary G. Brennan Foundation, and Vanderbilt University's Discover Grant and Faculty Development programs. Thanks to Abigail Levine for generating the radiocarbon dispersion calibration graph in figure 2.9.

Chapter 3

Late Formative Period Spatial Organization at Khonkho Wankane, Bolivia

Scott C. Smith

This paper reports architectural data recovered from excavations at the Late Formative period (200 BC–AD 500) site of Khonkho Wankane between 2001 and 2007 and presents a basic outline of construction phases. This research forms part of an ongoing analysis of the built environment and use of space during the Late Formative period at Khonkho Wankane (see S. Smith 2009 and S. Smith, forthcoming, for a detailed discussion and analysis of the architectural sequence). The Late Formative period was a politically dynamic time in the southern Lake Titicaca Basin. Influential multicommunity polities formed throughout the region, and by the end of the Late Formative period, one of these polities, centered at Tiwanaku, began to grow in both extent and population density, consolidating power within the region while at the same time strengthening social hierarchy within the site itself (Bandy 2001, 2007; Hastorf 2005; Janusek 2004b, 2004c, 2008; Kolata 1993, 2003b; Stanish 2003). The site of Khonkho Wankane, the capital of a proposed Late Formative multicommunity polity, presents an excellent opportunity to understand sociopolitical processes during this dynamic period. Between 2001 and 2007 Proyecto Arqueológico Jach'a Machaca, directed by John Janusek of Vanderbilt University, conducted excavations at the site (see contributions in Janusek 2005; Janusek and Plaza Martínez 2006, 2007). Much of the Late Formative architecture was relatively close to the surface, which allowed us to horizontally expose and reconstruct a comparatively large proportion of the built environment.

Khonkho Wankane is located about 30 km south of the site of Tiwanaku, across the Quimsachata mountain range in the Desaguadero subbasin of Bolivia. The site is located approximately 30 km southeast of Lake Titicaca and roughly 20 km northeast of the Rio Desaguadero. The immediate area surrounding Khonkho Wankane has been occupied since at least the Late Formative period through the present day. This paper, however, will focus principally on the Late Formative period occupation and the minimal Tiwanaku period occupation of the site. The center of Late Formative and Tiwanaku activity in the area was two adjacent mounds located about 1.5 km south of the foothills of the Quimsachata range. The southern mound, referred to as the Principal Mound (or Wankane Mound), is roughly U shaped and opens to the north. The Principal Mound encompasses an area of approximately 7 ha. The northern mound, referred to as the Putuni Mound, has been truncated by a small drainage and is roughly 3.3 ha in extent. The majority of the occupation of the site during the Late Formative period was centered on the Principal Mound (fig. 3.1).[1]

Extant architecture at the site consists largely of low foundation walls that would have supported adobe superstructures. Additionally, several large elevated platforms constructed of mounded soil are in evidence at the site. In general, foundation walls

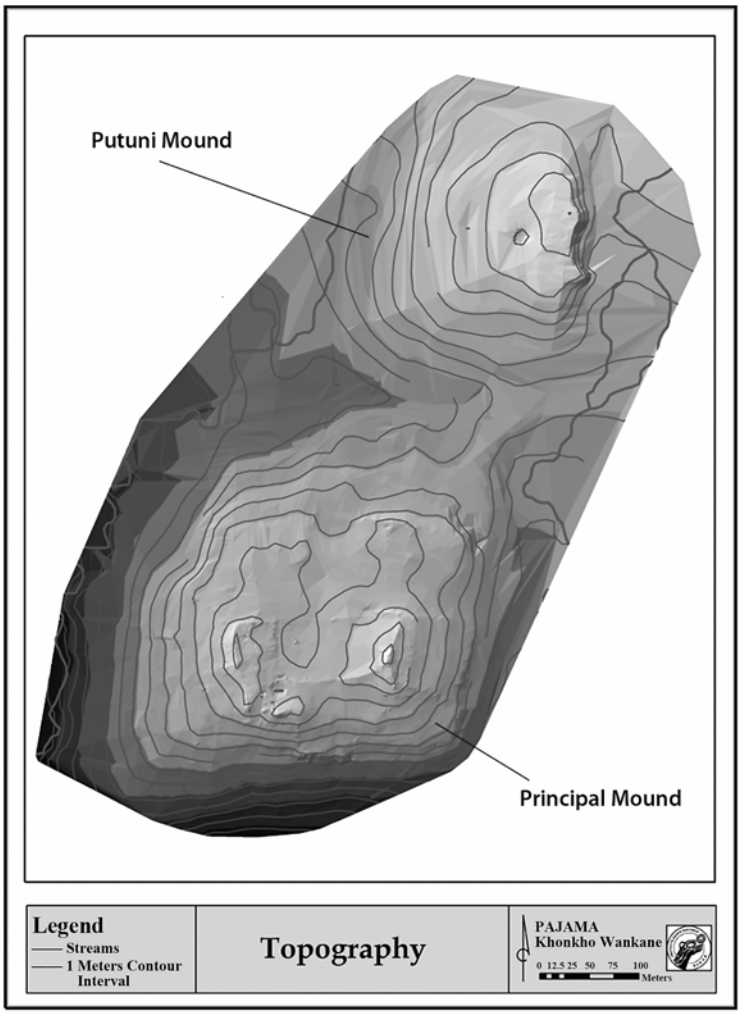

FIGURE 3.1 Topographic map of the study area.

consist of unworked or roughly hewn sandstone facing stones enclosing a wall core comprised of a variable mix of small angular stones and soil. Foundation walls range from having only one course to as many as three or four courses. Associated features such as hearths and storage annexes are typically a single course and constructed of unworked fieldstones laid out on the occupation surface extending from the main structure, often in the shape of a "bubble." Figure 3.2 shows the architectural features exposed to date at Khonkho Wankane. The site has been divided into fourteen sectors, and this paper will discuss the architectural components of each sector in turn (fig. 3.3).

Sector 1

Sector 1 is located on the Principal Mound and forms the western arm of the U shape of the mound (see fig. 3.3). The main architectural features of sector 1 are two sunken courts, adjacent to one another and aligned north to south (strs. 1.T1, 1.T2). These have sometimes been referred to as the "double court complex" in past publications (Janusek, Ohnstad, and Roddick 2003) and the Dual Court Complex in past presentations (S. Smith 2006) because they seem to have been in use contemporaneously at one point. Both were roughly rectangular in shape. The northern court (str. 1.T1) measured 22.7 by 19.3 m; the southern court (str. 1.T2), 21.7 by 16.7 m.

The north court wall measured roughly 30 cm in width and was constructed of a single line of cut stones. The extant stone foundation measured between 35 and 45 cm in depth and was embedded in an artificially constructed platform. Evidence of wall collapse was recovered above the floor levels associated with the north court,

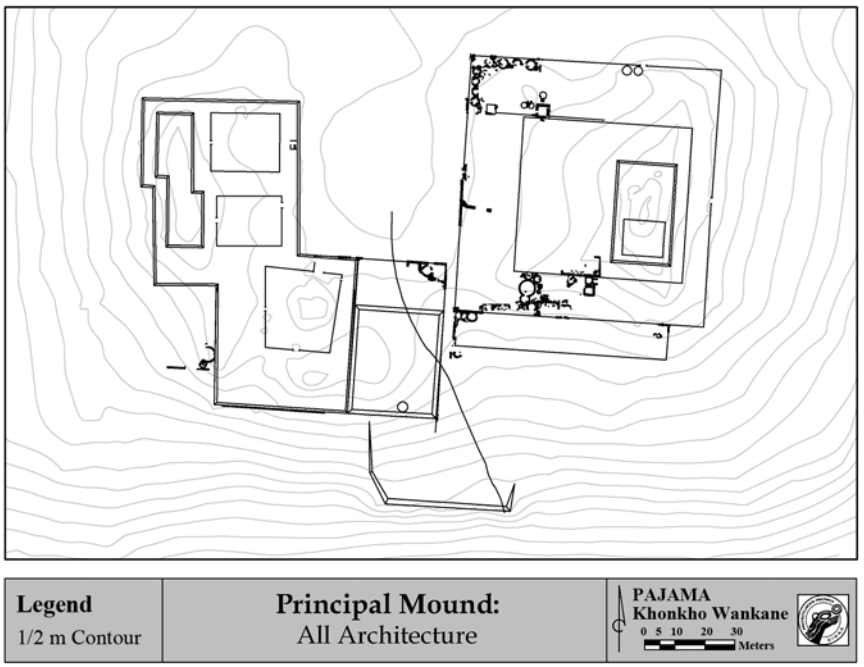

FIGURE 3.2 Map of the Principal Mound, showing architectural features.

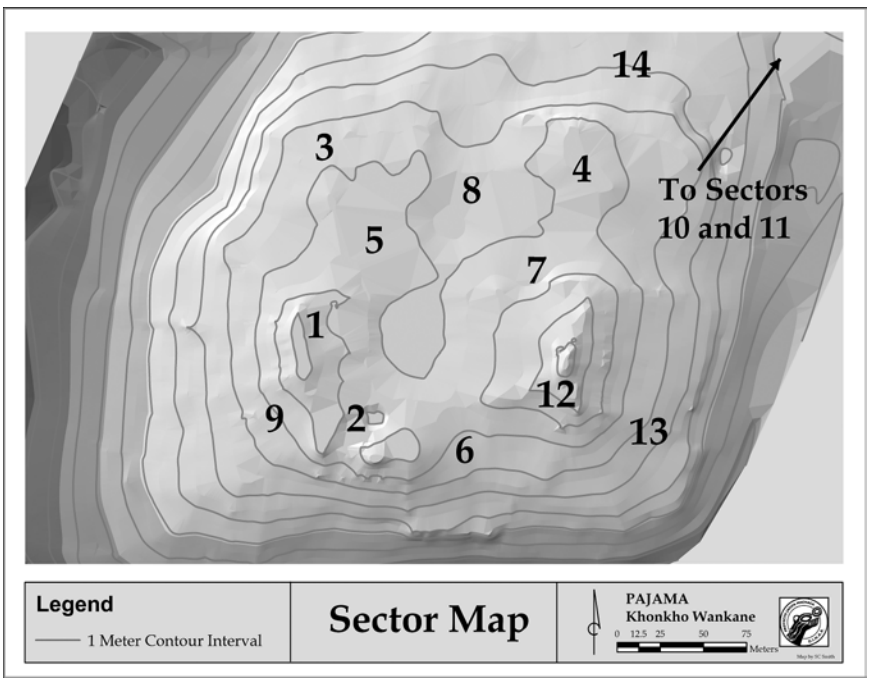

FIGURE 3.3 Map of the Principal Mound, showing sector locations.

prompting the conclusion that the original depth of the wall and court was greater. The floor of the north court was made from packed clay loam. Composed of two cut sandstone steps, the only exposed entrance to the north court was along the western wall. The western block measured 150 by 70 cm; the adjacent eastern step, 130 by 50 cm. It does seem likely, however, that an undetected central entrance to the north court also existed in the eastern wall. This is indicated by the presence of structure 1.E1, which was a constructed passageway that linked the Central Plaza (str. 7.B1) to the north court. This structure had two small niches approximately 1 m wide in the southern wall of the passage.

The south court in sector 1 was constructed from a single line of cut sandstone varying between 20 and 30 cm in width. The extant stone

foundation was embedded in the same earthen platform as the northern court and measured between 45 and 60 cm in depth. The floor of the southern court consisted of a reddish compacted clay loam with gravel inclusions. As with the northern court, the main entrance to the southern court was along the western wall, this time composed of three cut sandstone steps. The westernmost step measured 170 by 125 cm and is visible on the current ground surface just west of the court wall. The second step measured 170 by 80 cm, and the last, lowest step measured 125 by 30 cm. Along the southern wall, in the southwest corner of the court, a second potential entrance was encountered. A large collapsed block was exposed measuring greater than 150 by 160 cm (part of this block remains unexcavated). It is not certain at this time whether this block may have formed a part of a step. It had a similar shape to the blocks that form the highest steps on the western sides of both courts in sector 1; however, it was oriented in a way that seems to indicate that it was upright at one point and then collapsed partially into the open southern court.

Directly west of these two sunken courts in sector 1 was a large linear earthen platform approximately 45 m long by 20 m wide, oriented north to south (str. 1.G1). The original height of this platform is unknown due to heavy erosion. This platform was not rectangular but "jogged" to the east around its midpoint (see fig. 3.2). Both the sunken courts and the linear earthen platform were constructed on a large, earthen basal platform measuring roughly 62 m east to west by 58 m north to south (str. 1.G2). This platform was bordered by a wall (str. 1.W1) of a single line of cut sandstone blocks approximately 30–40 cm wide. The extant wall varied between 20 and 45 cm in height and was at most constructed of three courses. The wall was constructed of horizontally lain roughly worked blocks interspersed with vertically placed pilasters.

Sector 2

Sector 2 is located in the south-central region of the Principal Mound and was comprised of a rectangular earthen platform (str. 2.G1) and a large trapezoidal sunken court (str. 2.T1) (also referred to as the Sunken Temple). The platform was constructed immediately adjacent and to the west of the original southern compound wall (str. 6.W2, discussed below). This wall may have served as a retaining wall for the platform, although to date no potential retaining wall foundations have been recovered on the north, west, or south sides of the platform. The southern half of the sector 2 sunken court (str. 2.T1) was excavated into this platform. Consequently, the southern perimeter of the interior wall was more substantial than the northern perimeter. The southern perimeter was multicoursed, with deep-set pilasters that served as a revetment (fig. 3.4).

The northern perimeter was less substantial, but also more exposed to erosion because it was closer to the surface, potentially obscuring understanding of the original construction. The north wall of this sunken court was 26 m long; the south wall, 21 m long. The west wall was 27.1 m long, a meter longer than the east wall, which measured 26 m. The walls of this court were constructed of roughly hewn sandstone and limestone blocks. Horizontally lain slabs were interspersed with vertical pilasters, which were embedded 20–40 cm into the underlying clay stratum and supported the horizontal segments. It is likely that the perimeter wall supported an adobe superstructure. Internal surfaces of many of the stones contained fragments of white plaster as well as chunks of colored clays. Additionally, fired bricks were recovered from sector 2 sunken court contexts, some with flecks of paint preserved, potentially indicating that the interior of the court was covered with a painted frieze.

The sector 2 sunken court had four entrances, with the primary threshold located in the south. This entrance, which was 160 cm wide, was located in the center of the southern wall and was comprised of three steps flanked by two andesite pilasters. The top step consisted of a carved rectangular andesite block, the middle step consisted of a carved red sandstone block, while the bottom step was constructed of white limestone. The topmost andesite step has since been raised to stand on end south of the entrance.

The west wall held a smaller (120 cm wide), centrally located entrance consisting of andesite steps flanked by two andesite pilasters. A narrow

FIGURE 3.4 The sunken court (str. 2.T1), showing the southern entrance, facing southwest. *Photograph by Wolfgang Schüler.*

(50 cm wide) entrance was located along the east wall in the northeast corner of this sunken court. This entrance provided access to the court from an open space in between the court and the southern compound (str. 6.W1) to the east. At one point during the construction history of the site, the western wall of the southern compound was removed, and the northern wall of this compound was extended north of the sector 2 sunken court. This sequence will be discussed in greater detail below, but this extension (str. 6.W2) may have given privileged access to this sunken court for the residents of the southern compound through both the entrance in the eastern wall and the northern entrance. This wall delineated a wide (3.25 m) corridor (str. 2.E1), which led to the northern entrance of the sector 2 sunken court.

Sector 3

Sector 3 is located on the northernmost tip of the western arm of the U that forms the Principal Mound. Excavations in sector 3 yielded evidence of residential occupation during the Late Formative period that was later truncated by a series of Tiwanaku period burials. Residential remains included a remnant floor (str. 3.F1) that had been resurfaced at least once in association with an adobe brick. A fragmented alignment of fieldstones that was likely a rectangular foundation wall (str. 3.W1) was uncovered running north to south in association with the remnant occupation surface.

Also located in sector 3 were the remains of what was probably the northeast corner of a compound (str. 3.W2). Only three stones associated with this compound were located, due to heavy erosion and agricultural disturbance in the area.

Sector 4

Sector 4 is located on the northern tip of the eastern arm of the U that forms the Principal Mound. Excavations in sector 4 revealed residential deposits that had been highly disturbed by historic and modern agricultural activities. The primary architectural feature in sector 4 was a large, rectangular multiroomed structure (str. 4.R1), the foundation of which was constructed from angular fieldstones. Attached to the western wall of this structure was a smaller structure (str. 4.R2) that contained a hearth feature and another attached stone feature interpreted to have been a storage annex. Subsequent testing indicated that this structure was in fact temporally distinct from structure 4.R1 and was constructed earlier. Because the earlier structure 4.R2 seems to have been "joined" to the later structure 4.R1, the latter respecting the orientation of the original, it is likely that structure 4.R2 continued to be used after the construction of the larger building.

Sector 5

Limited excavations in sector 5 did not reveal any architecture. The principal archaeological deposit in this sector was a midden.

Sector 6

Sector 6 delimits the area along the south-central edge of the Principal Mound, east of sector 1. One prominent architectural feature in sector 6 was the southern compound (str. 6.W1), located 5 m east of the sector 2 sunken court (str. 2.T1). The southern compound was defined by a large rectangular wall measuring 29.6 m along the northern and southern sections and 51.5 m along the eastern and western perimeters. This compound wall was constructed of a double line of roughly hewn sandstone facing blocks containing a core of angular stone and soil fill. A portion of the western perimeter was removed at one point during the Late Formative period to allow for the extension of the northern section of the compound wall 11.5 m west toward the sector 2 sunken court (str. 2.T1). This extension (str. 6.W2) linked the southern compound to this sunken court and at least partially restricted court access to the occupants of the southern compound (see also sector 2). In the center of the original northern wall, a cobble-paved entrance (6.E1) 2.5 m wide was exposed (fig. 3.5).

The majority of the interior of the southern compound was overlain by a later earthen platform that will be discussed below (str. 6.G1). This has limited our ability to investigate potential structures or activities that would have been located in the central portion of the compound. One complete circular structure (str. 6.C1), however, was exposed along the northern perimeter of the compound wall (str. 6.W1) inside the compound, and a portion of a second circular structure (str. 6.C2) was also encountered along the southern perimeter. The northern circular structure (str. 6.C1) measured 3 m in diameter and was constructed using two different techniques. The northern half of the structure was constructed in the typical style at the site during the Late Formative period; it consisted of a double row of facing blocks containing a wall core of angular stones and soil. The southern half of the structure was defined by the boundary of a patio surface constructed of unworked, rounded river cobbles (fig. 3.6). This may indicate that the structure was repaired or reconstructed at some point during its use. This structure had an annex on its western side and was entered from the east. The entrance was oriented toward the northeast corner of the compound wall rather than the central area of the compound to the south.

The southern section of the compound wall remains undefined and partially overlain by a large earthen platform, discussed below. A stone-lined canal (str. 6.D1), which drained the plaza to the north (7.B1; see sector 7), originally ran southeast under the compound wall and emptied off the south side of the Principal Mound. A second circular domestic structure (str. 6.C2) has been partially uncovered south of the compound

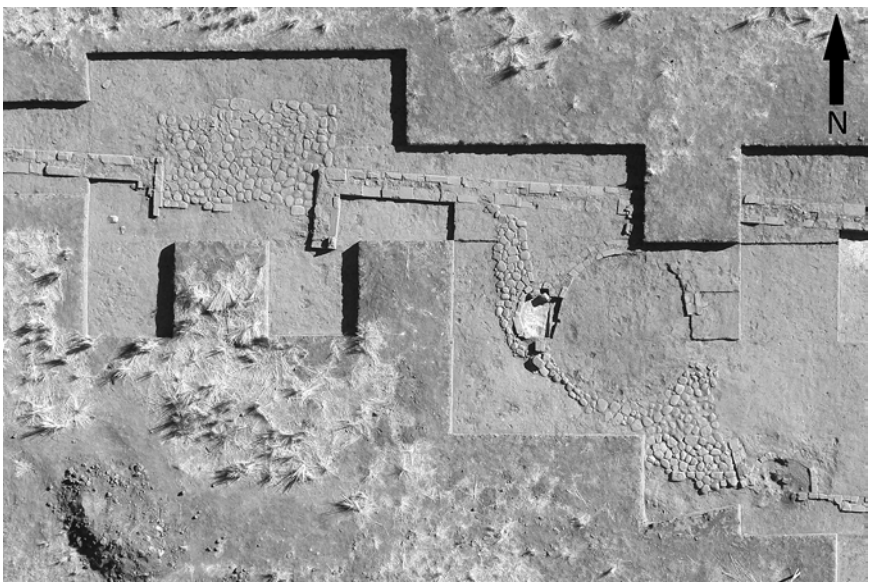

FIGURE 3.5 Aerial photograph of the northern entrance (6.E1) to the southern compound and a complete circular structure (str. 6.C1).

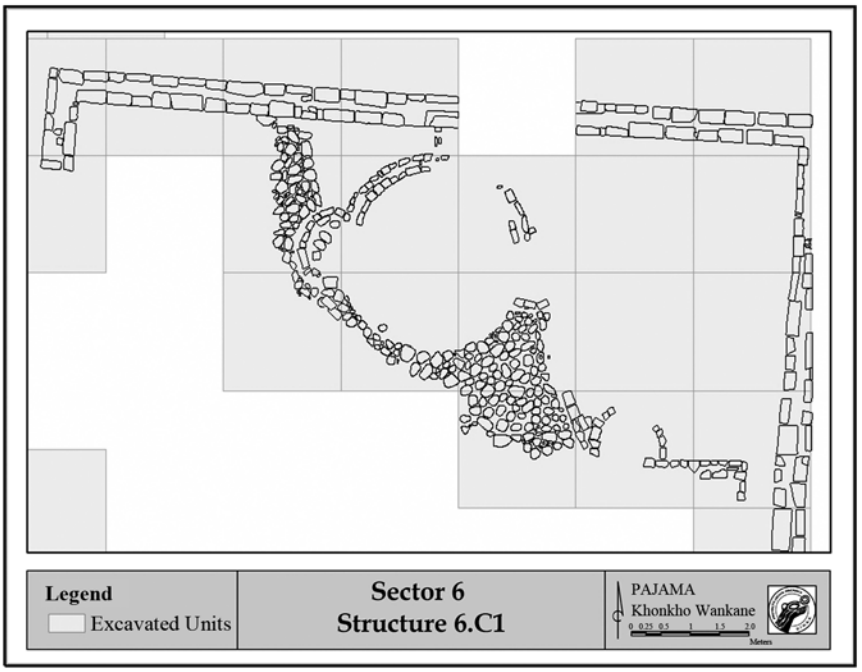

FIGURE 3.6 Plan of structure 6.C1.

along the southern edge of the rectangular plaza or patio. Nearby excavations revealed two floors underlying the surface associated with this structure, but to date no associated architecture has been exposed. Overlying structure 6.C2 and the southern two-thirds of the compound was a large earthen platform measuring approximately 36 m north to south and 30 m east to west (str. 6.G1). This platform was constructed directly overlying the foundation wall for the larger compound (str. 6.W1), and the limit of the platform followed this wall along the southern section of the compound. At this point there are no data to suggest that the platform covered the entire southern compound. The surface topography suggests that the platform covered approximately 70 percent of the original compound, leaving the circular structure (str. 6.C1) exposed and probably in use when the platform was constructed.

A later wall (str. 6.W3) was constructed extending west at least 45 m from the southwest corner of the compound. This wall was constructed by first excavating a builder's trench into the existing platform (str. 2.G1). In this cut, vertical pilasters were erected to add support to horizontal wall segments lain in between the pilasters. The wall segments were constructed of between one and three courses of cut sandstone blocks. The vertical pilasters varied between approximately 60 cm and 1 m in width and between 1 and 1.5 m in height and were approximately 30 cm thick. Nine of these pilasters are visible on the surface. Additionally, the south-central edge of the Principal Mound was modified to form an earthen terrace (str. 6.G2), extending 31 m south by 47 m east to west.

Sector 7

Sector 7 delimits the area north of sector 6 and includes the Central Plaza (7.B1) and the residential patio group immediately to the east of the plaza. The Central Plaza measures 54 m east to west and 70 m north to south. Situated in the center of the Central Plaza is the large Tata Kala monolith, and excavations have confirmed that this is the same location in which it stood during the Late Formative period (see also Ohnstad, chapter 5).

The patio group to the east of the Central Plaza diverged from the residential compound pattern discussed for sector 6 above. The patio group in sector 7 consisted of a series of at least twelve circular structures (strs. 7.C1 through 7.C12) located along the perimeter of the compound wall (str. 7.W1), all facing a central courtyard or patio (str. 7.P1) (figs. 3.7, 3.8). The patio area itself (str. 7.P1) measured 18.3 m north to

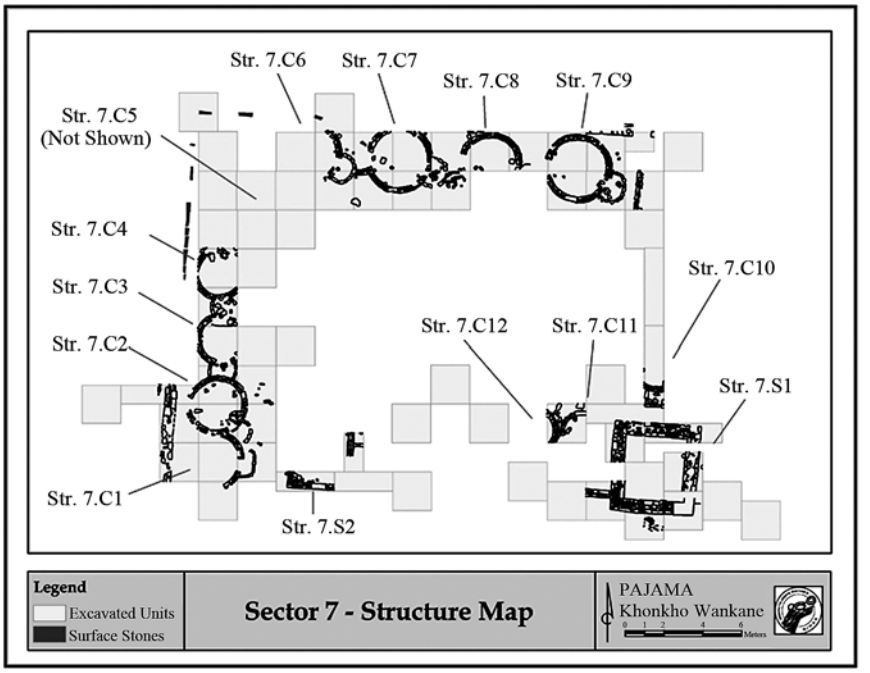

FIGURE 3.7 Plan of the sector 7 patio group (str. 7.P1).

FIGURE 3.8 Aerial photograph of the sector 7 patio group (str. 7.P1), facing northeast.

south and 22.8 m east to west. All of the circular structures bounding the patio in sector 7 were constructed in the double-line style typical of Khonkho Wankane. These structures all measured 2.4 m in diameter, and many were structurally attached to each other by two small walls that formed a storage area between each house. Some of these storage areas yielded midden deposits. Erik Marsh (chapter 4) has been investigating this patio group, and the reader is referred to his article for a detailed examination of the material culture associated with these structures (see also Marsh 2006, 2007).

The western and northern perimeter of this patio group was actually the northwest corner of a larger bounded area (referred to as the eastern compound) that comprised the entire eastern half of the Principal Mound, including a large portion of both sector 7 and sector 12. This compound was delineated by a substantial wall (50 cm thick) measuring 83 m east to west and 85 m north to south (str. 7.W1). This wall was constructed using the typical double-line technique usually used to build walls at the site. Excavations in sectors 7 and 12 have revealed entrances in this wall along the northern perimeter 24 m west of the northeast corner, along the eastern perimeter 42 m south of the northeast corner (almost exactly in the center of the wall), and along the western perimeter 35 m south of the northwest corner. Both the northern and eastern entrances consisted of two sandstone steps, and the latter entrance was flanked by two pilasters of the same material. The western entrance consisted of a gap in the perimeter wall approximately 1.2 m wide. Interestingly, the wall blocks adjacent to the western entrance were inclined 8 degrees to the east, possibly indicating that in this area the compound wall (str. 7.W1) served as a retaining wall. Approximately 10 m south of the western entrance to this compound, a stone-lined canal was exposed (str. 7.D1). The canal was constructed of roughly cut blocks and had a paved bottom with an interior width of 30 cm. The canal seemed to drain the earthen platform to the east (str. 12.G1) into the Central Plaza (7.B1). It is possible that this canal drained the hypothetical sunken court (str. 12.T1) that was detected by earth resistance survey to the east (see Sector 12 below).

The patio group was bounded on the east by a smaller wall (30 cm thick) constructed in the same manner. Fragments of this wall were detected, and it probably originally measured roughly 19 m north to south (str. 7.W2). The patio group was bounded on the south by a more substantial wall constructed in the common double-line manner. It measured 21 m east to west and was approximately 40 cm thick (str. 7.W3). Intersecting the southern perimeter wall (str. 7.W3) and actually forming part of the wall itself were two square structures (strs. 7.S1, 7.S2). Structure 7.S1 measured 4.5 m east to west and 4.6 m north to south. The foundation of structure 7.S1 was significantly more substantial than both structure 7.S2 (discussed below) and the circular structures in the patio group and measured 70 cm in width. Additionally, this foundation wall had as many as three courses, while the other structures in sector 7 tended to have only a single course. Structure 7.S2 measured 3.3 m east to west and at least 3 m north to south (the northern limit of the structure remains unexcavated). The foundation walls of this structure were 30 cm thick and were constructed using the same method as the circular structures in the patio group.

Sector 8

Sector 8 is a topographic depression immediately to the west of sector 4. Limited excavation in sector 8 revealed evidence of a single residential structure (str. 8.R1). Preservation of this structure was poor due to historic and modern agricultural activities, and only the northeast corner of this structure was exposed. The foundation wall of this structure measured approximately 30 cm in width and was constructed of a double line of roughly worked sandstone, much like other structures at Khonkho Wankane. The foundation wall of structure 8.R1 seemed to have been more disorganized or improvised in comparison to other walls at the site, which may indicate that the stones for this structure were removed from older buildings.

Sector 9

Sector 9 comprises the southwest corner of the Principal Mound. The main architectural

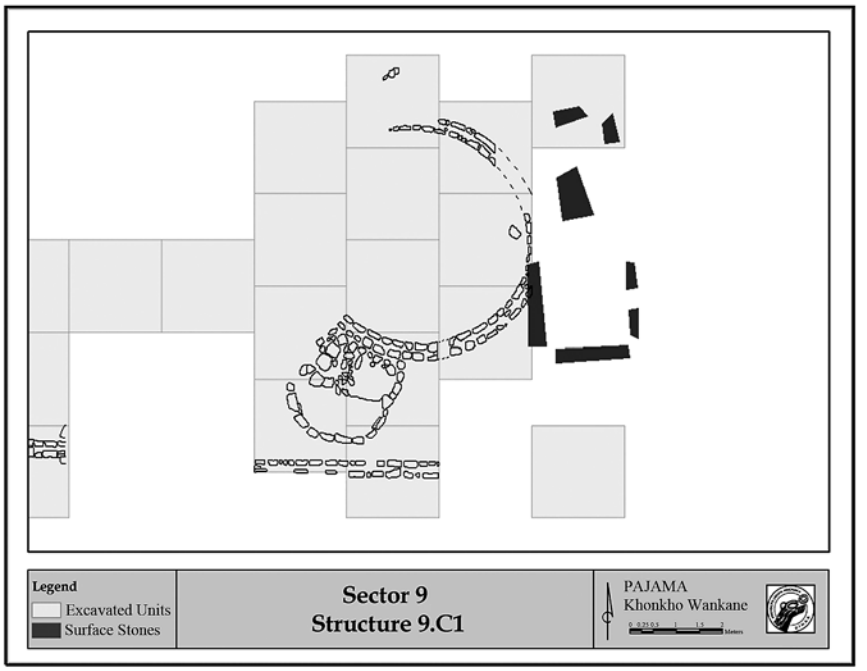

FIGURE 3.9 Plan of structure 9.C1.

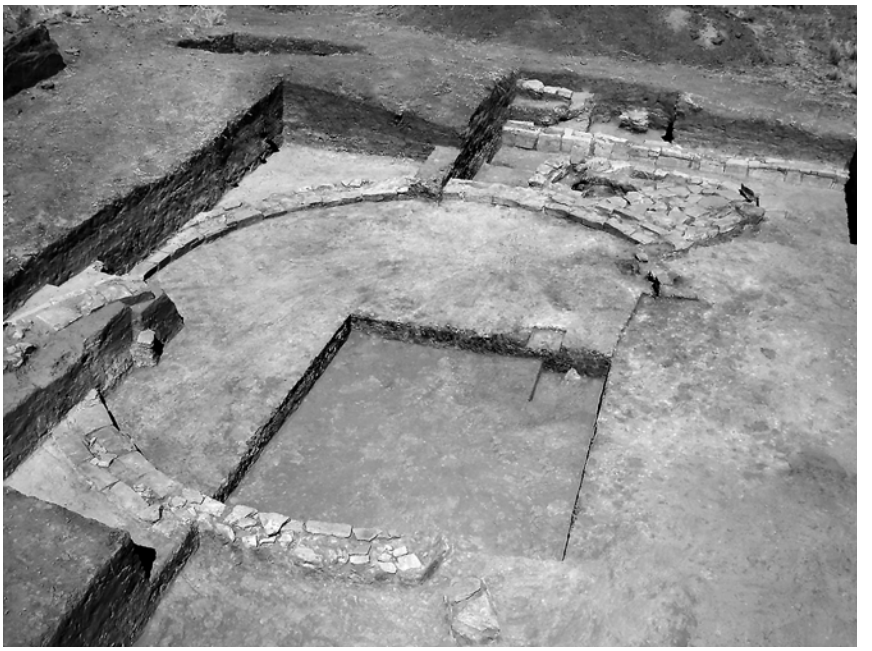

FIGURE 3.10 Structure 9.C1, facing southeast.

component uncovered in sector 9 was a large (4.4 m in diameter) circular structure (str. 9.C1) with an attached annex containing a hearth (figs. 3.9, 3.10). The foundation wall of this structure was 35 cm wide and constructed in the style typical of most of the structures at the site, with two lines of facing stones containing a wall core. The western portion of the structure's foundation wall was highly eroded, erasing any trace of an entrance. The attached hearth extended to the south from the structure wall and seems to have been enlarged at one point during the use of the structure. A portion of a later circular structure (str. 9.C2), which overlaid structure 9.C1, was exposed as well. This structure was stratigraphically distinct from structure 9.C1 and was constructed after the abandonment of this structure. Immediately to the south of this circular

structure, a linear wall, running east to west, was uncovered (str. 9.W1). This wall measured 27.4 m east to west and was 37 cm thick (Zovar 2006).

Sector 10

Sector 10 delineates the eastern side of the Putuni Mound, located northeast of the Principal Mound. Limited excavations in sector 10 revealed several ephemeral surfaces overlain by a thick (90 cm) stratum of sterile fill (Fox 2005; Ohnstad 2007). These preliminary excavations seem to indicate a possible Late Formative period occupation followed by the construction of an earthen platform (str. 10.G1). It is possible that the Late Formative period occupation was temporary and periodic, an argument advanced by Arik Ohnstad (2007). Strata overlying the fill stratum yielded ceramics associated with Tiwanaku but no discernible architectural features. No architectural features were revealed in strata associated with Late Formative period ceramics.

Sector 11

Sector 11 comprises the western side of the Putuni Mound. Limited excavations in sector 11 did not reveal any architectural features. These investigations did reveal the presence of a Tiwanaku period sheet midden and an earlier ash pit (Ohnstad 2007).

Sector 12

Sector 12 delineates the eastern portion of the Principal Mound. As mentioned above (see sector 7), a large wall (str. 7.W1) enclosed much of this sector. Immediately to the west of the northern entrance were two circular structures both measuring 2.4 m in diameter (strs. 12.C1, 12.C2). These structures were located adjacent to each other, and both were immediately adjacent to the south of the compound wall mentioned above (str. 7.W1). Additionally, the eastern structure (str. 12.C2) had an attached storage annex (Gladwell 2006a).

In the southwest corner of the compound, excavations revealed a circular structure (str. 12.C3) measuring approximately 2.7 m in diameter directly abutting the large perimeter wall (str. 7.W1) but located outside of the compound (fig. 3.11). Stratigraphically, the structure predates the compound wall, and excavations revealed that the structure was truncated by the construction of the compound. Despite being cut by the compound wall, structure 12.C3 remained highly significant because it seems to have been repaired on the eastern side using a different construction technique. The original structure was constructed in the typical double-line style mentioned

FIGURE 3.11 Aerial photograph of structure 12.C3 showing partially excavated cist tomb.

above, while the later repair was made using a single line of roughly cut blocks. A subfloor cist tomb with two collapsed and broken capstones was uncovered in the center of this structure, probably contributing to the significance associated with the structure that warranted the later maintenance (S. Smith and Pérez Arias 2007).

Associated with structure 12.C3 was a second structure (str. 12.S1) located 2 m to the west. This structure was square, measuring 2.5 m on a side, and was not aligned to the compound perimeter wall (str. 7.W1). The foundation wall of this structure was also constructed in the double-line style but was somewhat smaller (25 cm in width) than many of the other structures at the site where this construction technique was used. Associated with these two structures was a hearth feature (12.H1). However, this hearth was not delineated with stones or directly attached to the circular structure, as was the case with many other hearths at the site. To the west of these two structures and extending south from the compound perimeter wall (str. 7.W1) was a linear wall. This wall (str. 12.W1) was 40 cm wide and at least 9.5 m long. although its complete dimensions remain unknown due to heavy erosion along the southern slope of the Principal Mound.

Approximately 8.5 m south of the eastern compound perimeter, this wall turned west for 40 cm before turning back south. It is possible that this "jog" may have been integrated into the wall to reinforce the superstructure against the strong east–west wind in the Desaguadero drainage, a technique used today in the region. Excavations between this wall and the southern compound perimeter wall (str. 6.W1) to the west revealed a passage paved with pebbles (12.F1). Farther south, excavations revealed another structure that was slightly oval in shape (str. 12.C4). The stones used to build this structure seemed to have been removed from other buildings. They tended to be cut, as with other structures, but not cut with the design of this particular structure in mind.

Moving east along the interior of the compound perimeter wall (str. 7.W1), excavations revealed a series of four very disturbed, connected circular structures (strs. 12.C5 through 12.C8). The eastern half of structure 12.C8, however, was fairly well preserved. It was constructed of a double line of roughly cut blocks but did not have the wall core present in similar structures. The entrance to structure 12.C8 faced north, and the structure had a storage annex extending to the northeast. Farther to the northeast, a large circular structure was exposed (str. 12.C9) (figs. 3.12, 3.13). The inner diameter of this structure measured 4.9 m, and the width of the foundation wall was 30 cm. The remains of an adobe brick superstructure were detected along the eastern section of the foundation wall; however, only the bottom 15 cm of the bricks remained. Structure 12.C9 had a very large circular annex measuring 2.8 m in diameter that extended off the southern section of the wall.

Directly north of the large circular structure (12.C9), excavations exposed another circular structure (str. 12.C10). The inner diameter of this structure was 2.4 m, and the foundation walls were 27 cm wide. Approximately 30 cm of the original adobe superstructure was preserved in the northern section of this structure. The entrance to structure 12.C10 was on the western side, and a later hearth feature (12.H2) was built into this entrance. Immediately outside this structure to the west, underlying and partially preserved by the hearth feature, was a pebble-paved floor surface (12.F2).

East of structure 12.C10, excavations exposed another circular structure (str. 12.C11). Most of this structure was built using a single line of roughly cut blocks rather than the double-line style typical of Khonkho Wankane. Structure 12.C11 was also slightly smaller than the majority of the circular structures at Khonkho Wankane, measuring 2.1 m in diameter. This structure had two annexes, on the north and south sides, and an entrance that faced east.

South of structure 12.C11 and directly east of structure 12.C9, two small circular structures were encountered (strs. 12.U1, 12.U2) (fig. 3.14). The northern structure (str. 12.U1) measured 1.4 m in diameter; the southern structure (str. 12.U2), 1.1 m in diameter. Both structures were constructed of a single line of roughly cut blocks that varied in size and shape. Additionally, both structures were filled to the top of the cut blocks with a mix of gravel and soil. No evidence of burning and very few artifacts were recovered

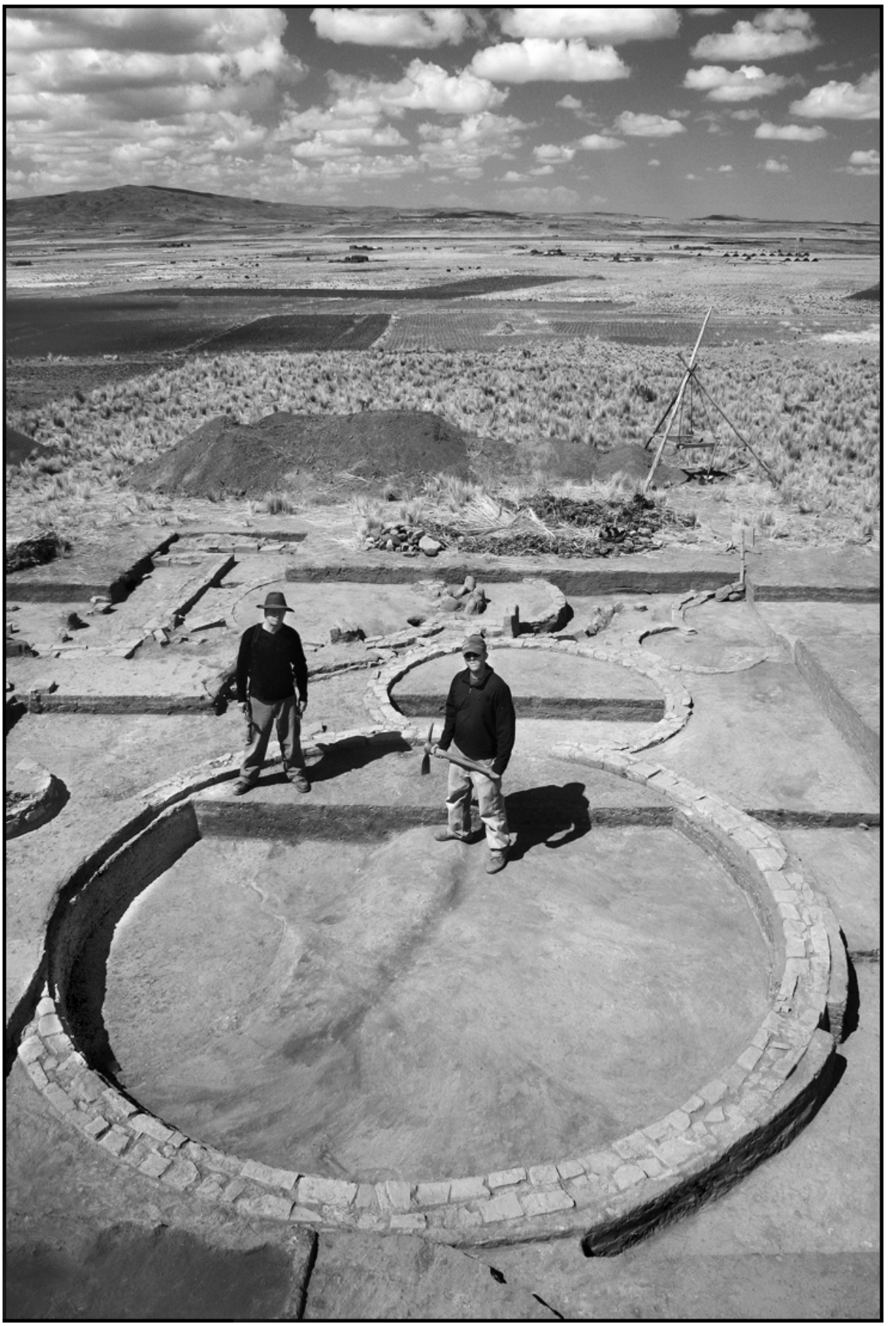

FIGURE 3.12 Structure 12.C9, facing south.

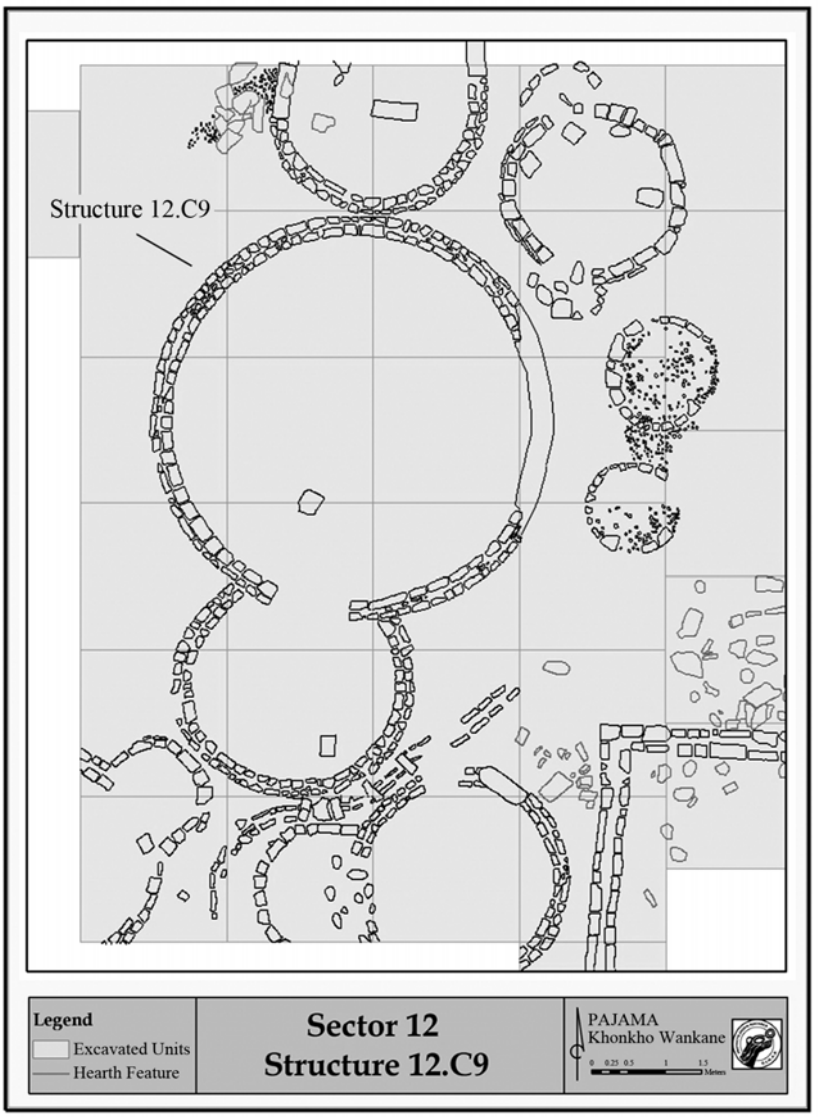

FIGURE 3.13 Plan of structure 12.C9.

FIGURE 3.14 Structures 12.U1 and 12.U2, facing southeast.

from this fill. At this point the function of these structures remains undetermined.

To the southeast of structures 12.U1 and 12.U2, excavations exposed a rectangular structure measuring 3.9 m north to south and 7.3 m east to west (str. 12.R1). This structure was located directly north of the large compound wall (str. 7.W1). The entrance to structure 12.R1 was located along the north wall, and, as with structure 12.C10 (mentioned above), a later hearth feature (12.H3) was added immediately adjacent to this entrance. Structure 12.R1 was flanked by two circular structures to the west and east, both of which measured 2.7 m in diameter. The western circular structure (str. 12.C12) had an attached annex on the western side that was used as a hearth. Associated with this structure was a small (approximately 10 cm wide) stone-lined drainage canal (12.D1). The circular structure to the east of structure 12.R1 (str. 12.C13) was very eroded and remains poorly understood.

Located 3 m farther east along the southern perimeter of the large compound wall were two square structures oriented north to south (strs. 12.S2, 12.S3). These structures were directly adjacent to each other, separated by 50 cm. Bridging this space were two small walls that attached the structures together, forming an annex. The southern structure (str. 12.S2) measured 3 m on a side; the northern structure (str. 12.S3), 2.5 m. Both structures were built in the double-line style typical of the site. Interestingly, the entrances to these structures were on opposite sides. The northern structure was accessed from the west, while the southern structure's entrance was located on the east. Directly outside the entrance to the southern structure, excavations exposed a pebble patio surface (12.F3). Located adjacent to the northern structure to the east was a hearth feature (12.H4) that may have postdated the construction of the structure. Additionally, a portion of the adobe brick superstructure was recovered overlying the foundation wall of the northern structure on the north and east sides. Located 3.25 m west of the northern square structure was another circular structure (str. 12.C15). This structure was 2.55 m in diameter and had two attached annexes ("bubbles") to the south and east.

Excavations revealed a large rectangular structure (str. 12.R2) measuring 12.9 m east to west and 6.5 m north to south located 30 cm to the north of the northern square structure. This structure seemed to respect the presence of the square structure to the south despite being separated stratigraphically from the structure by a 70 cm fill stratum. This fill stratum was the southern extent of a large earthen platform (str. 12.G1) located in the center of the eastern compound. The boundaries of this platform are highly eroded, but surface topography suggests that it may have measured approximately 56 m east to west by 52 m north to south; however, these dimensions remain to be established with further testing. Also suggested by surface topography is the presence of a second, smaller platform (str. 12.G2) constructed on top of the larger platform (str. 12.G1). This platform seems to measure approximately 34 m north to south by 20 m east to west. Limited excavations were conducted in this area of the site, but an L-shaped transect was investigated by the author with earth resistance survey (S. Smith 2009; see also Dayton 2006). This survey revealed a possible sunken court (str. 12.T1) cut into the platform and measuring approximately 12 m north to south by 14 m east to west (fig. 3.15). This structure was delineated by lines of high electrical resistance oriented almost precisely to the larger eastern compound wall (str. 7.W1). Additionally, the stone-lined drainage canal discussed above (str. 7.D1) was oriented such that it appears to be heading away from the proposed sunken court, as if constructed to drain the rainwater that would inevitably accumulate within the court.

Located approximately 32 m farther east along the large eastern compound wall (str. 7.W1), excavations exposed fragments of a wall extending south off the larger compound wall. This wall may have formed the boundary of a distinct compound at some point. It is argued here that this wall originally connected to the wall discussed above that extended south from the southwest corner of the large eastern compound wall (str. 12.W1). Unfortunately, the southern sections of the Principal Mound are mostly destroyed due to natural erosion and agricultural disturbance, making it

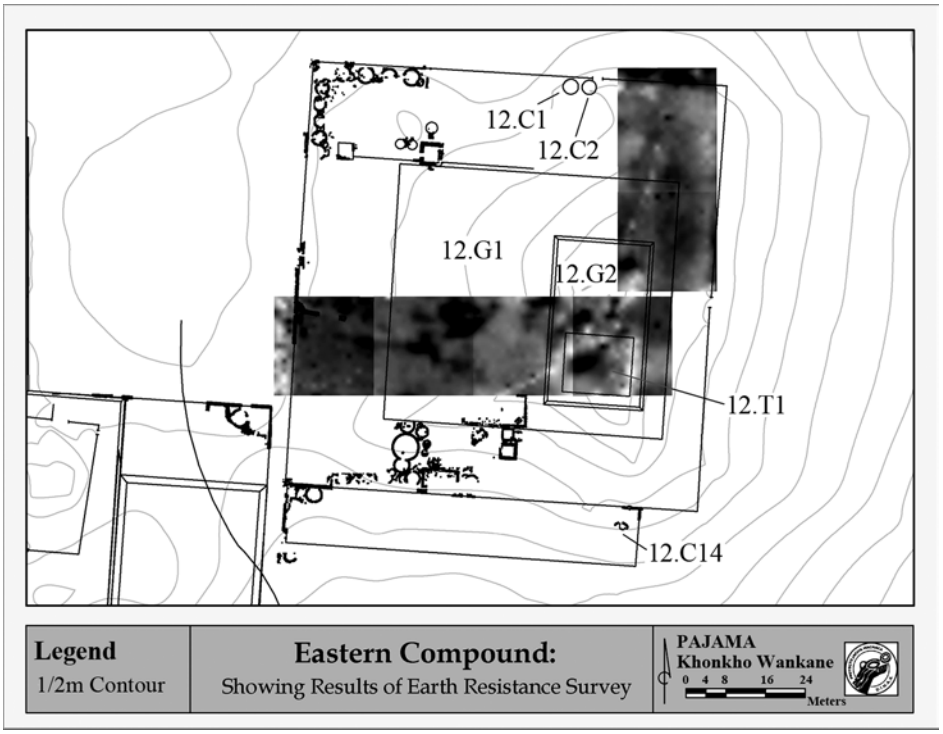

FIGURE 3.15 Eastern compound architecture, showing results of resistivity survey indicating the presence of structure 12.T1.

difficult to know conclusively the relationship between these two areas of the site. In the corner formed by the large eastern compound wall and the southward-trending wall discussed above, the partial remains of a circular structure were encountered (str. 12.C14). Unfortunately, this structure is poorly understood because only a small portion remains.

Sector 13

Excavations in sector 13, on the southeast edges of the Principal Mound, revealed no stone architecture, possibly due to heavy soil erosion in this area. Investigations in the area did, however, reveal evidence of the extent of anthropogenic modification of the mound itself. A deep excavation that probed to sterile subsoil revealed that the original precultural hill was modified by the addition of at least 3.7 m of soil in four distinct episodes. The construction and modification of the mound itself is the subject of a dissertation (in progress) by another Proyecto Arqueológico Jach'a Machaca team member (Arik Ohnstad from Vanderbilt University). The reader is referred to Ohnstad's excellent work on this topic for more information (see Ohnstad 2007 and chapter 5).

Sector 14

Limited excavations in sector 14 exposed a 2 m section of an east–west-trending wall (str. 14.W1). This wall was constructed in the double-line style characteristic of Khonkho Wankane and measured approximately 40 cm in width. It is possible that this wall may have formed a section of a potential northeast compound similar to the compound corner exposed in sector 3 to the west (str. 3.W2). More testing is required to assess this proposition.

CONSTRUCTION PHASES

Phase 1 and Phase 2

Phases 1 and 2 are represented by floor surfaces and associated occupation contexts. At this time, very little of these surfaces have been exposed, and no associated architecture has been documented. Phases 1 and 2 seem to date, based on

associated ceramics, to Late Formative 1 (~100 BC–AD 250).

Phase 3

Phase 3, which dates to Late Formative 1, represents a significant change at the site. Phase 3 is associated with the first architecture constructed (figs. 3.16, 3.17). In sector 12 a series of circular structures were constructed (strs. 6.C1, 12.C3, 12.C6 through 12.C10). Although we have not been able to identify entrances to all of these structures, those that we have identified all face a central patio area (12.P1). The association of structure 6.C1 with Phase 3 is hypothetical at this point. As will be discussed below, the southern compound wall (str. 6.W1) is associated with Phase 4. While structure 6.C1 seems to be spatially associated with this wall, several things indicate that this structure may have been constructed

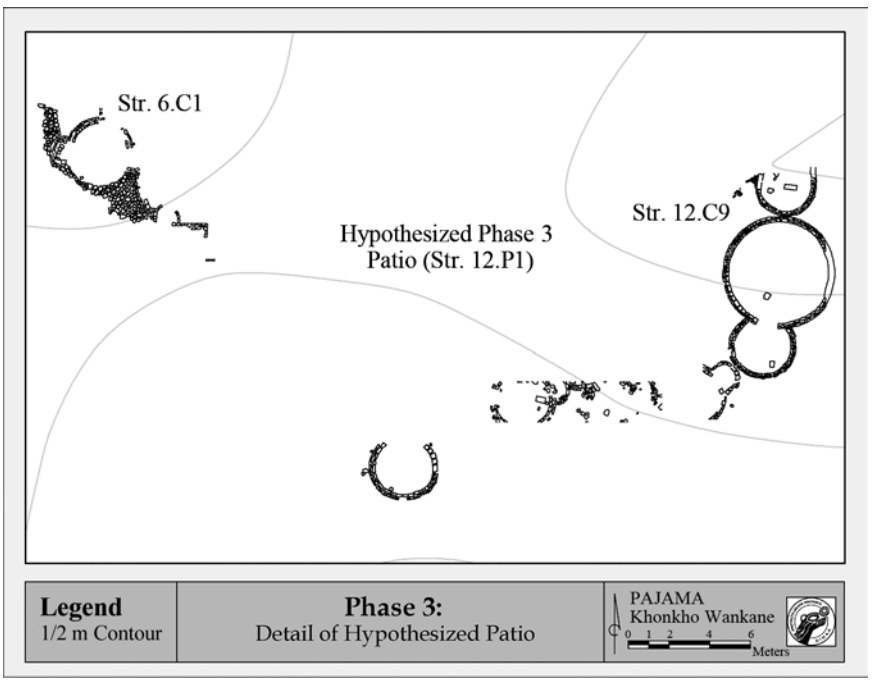

FIGURE 3.16 Plan of Phase 3 architecture.

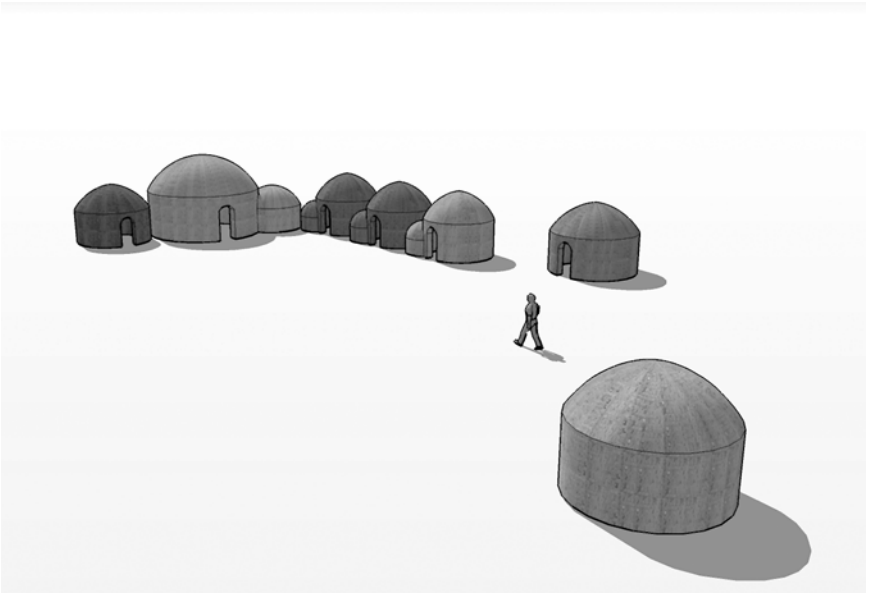

FIGURE 3.17 Reconstruction of Phase 3 built environment, facing southeast.

earlier. First, as noted above, the structure was built using two distinctly different construction techniques. Additionally, the entrance to this structure faces east, toward the northeast corner of the compound wall rather than the central portion of the compound. This structure faces the central courtyard area (12.P1) outside the compound mentioned above, which supports the hypothesis that it was constructed during Phase 3 and predates the construction of the southern compound wall. More testing is required to understand the stratigraphic relationship between structure 6.C1 and the southern compound wall (str. 7.W1). Additionally, it seems likely that two of the three interior circular structures in sector 7 were constructed during Phase 3 (strs. 7.C11, 7.C12).

Phase 4

During Phase 4 almost all of the Phase 3 structures continued to be used, although the inhabitants of the site began to enclose these structures within compound walls (strs. 6.W1 and 7.W1) (figs. 3.18, 3.19). Structure 6.C1 was repaired during this phase and enclosed within the southern compound wall (str. 6.W1). At this point the sector 2 earthen platform (str. 2.G1) was built, and the sunken court (str. 2.T1) was partially embedded in it. This platform used the southern compound wall (str. 6.W1) as a boundary/retaining wall along the east side. Additionally, while Phase 3 structures were almost entirely circular, new structures in Phase 4 tended to be of a variety of forms: circular, rectangular, and square (strs.

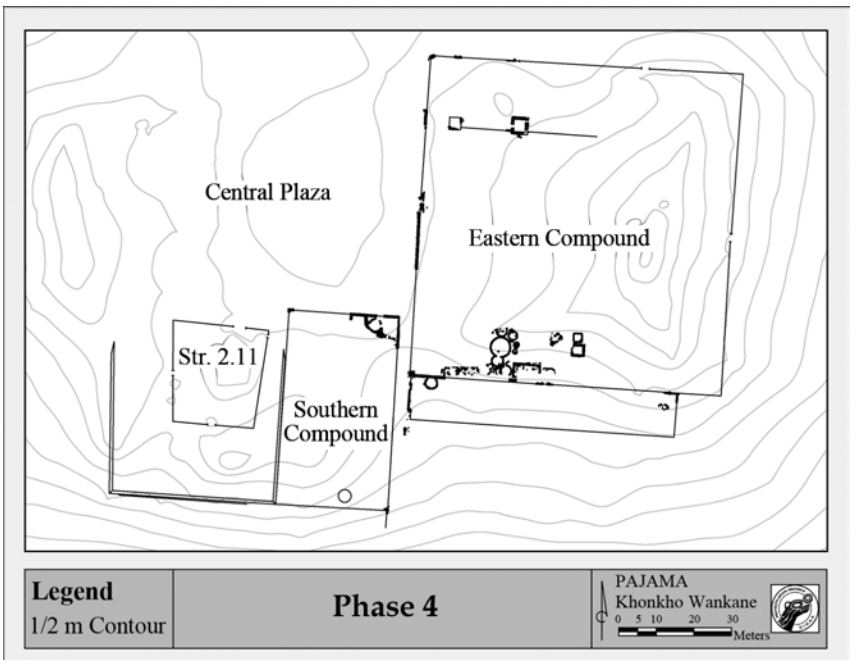

FIGURE 3.18 Plan of Phase 4 architecture.

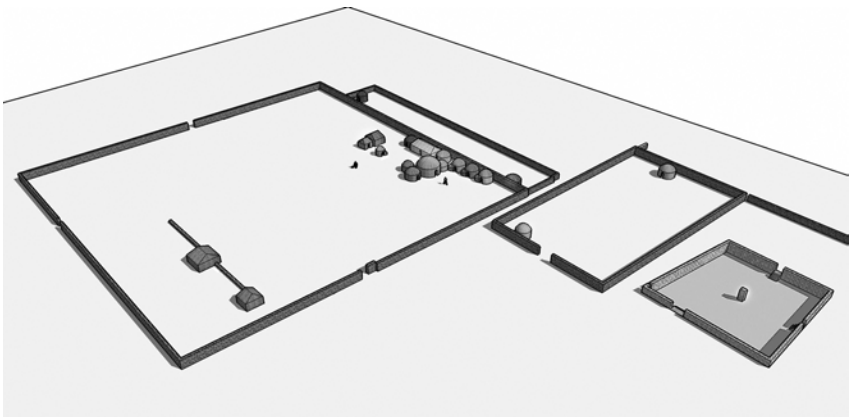

FIGURE 3.19 Reconstruction of the Phase 4 built environment, facing southeast.

12.S2, 12.S3, 12.R1, 7.S1, 7.S2). During the process of constructing the large eastern compound wall, structure 12.C3 was cut and then repaired, probably because of the presence of an earlier subfloor burial. It seems as though the structure was maintained as a type of mausoleum. Further, new public and semipublic spaces were defined during this construction phase. While this Phase 3 patio area (12.P1) continued to be used, an additional patio area was defined farther east (12.P2). Similarly, the Central Plaza was defined as a space during Phase 4 by the construction of compound walls to the east and south.

The newly constructed eastern compound enclosed the area in which the northern Phase 3 circular structures were constructed; however, these structures were abandoned during Phase 4, and two new square structures, connected by a wall trending east to west, were built. These two square structures (strs. 7.S1, 7.S2) faced south onto a public or semipublic space in the center of the eastern compound. At this point, access to the eastern compound has been identified along the east and north walls as well as from the plaza to the west. Access to the southern compound seems to have been primarily from the plaza to the north. Phase 4 also dates to the Late Formative 1.

Phase 5

Changes during Phase 5 were less pronounced than in the transition between Phase 3 and Phase 4. At this point the northwestern corner of the southern compound wall was removed, and the passage between the southern compound and the sector 2 sunken court (str. 2.T1) was constructed (figs. 3.20, 3.21). This connected the southern compound directly to the northern entrance to

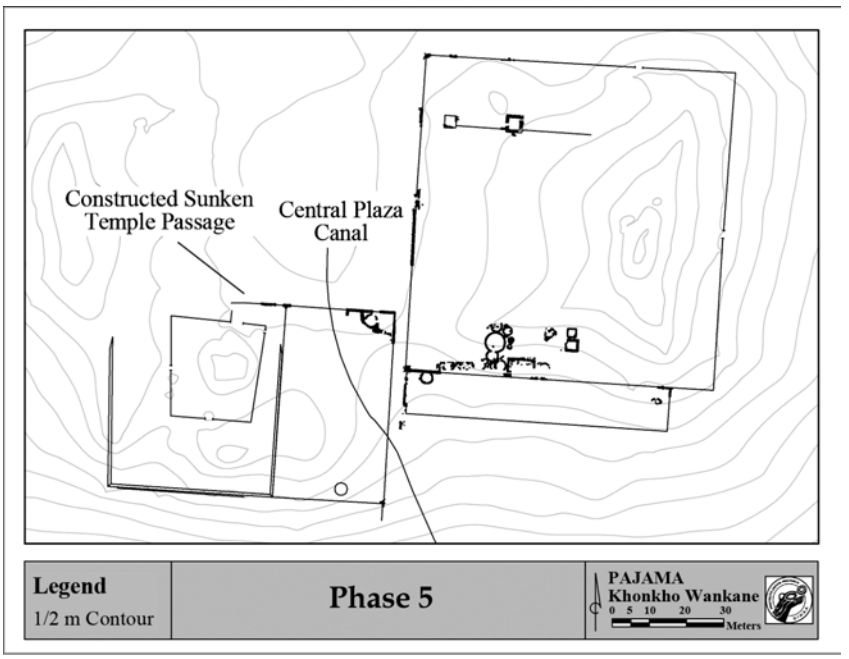

FIGURE 3.20 Plan of Phase 5 architecture.

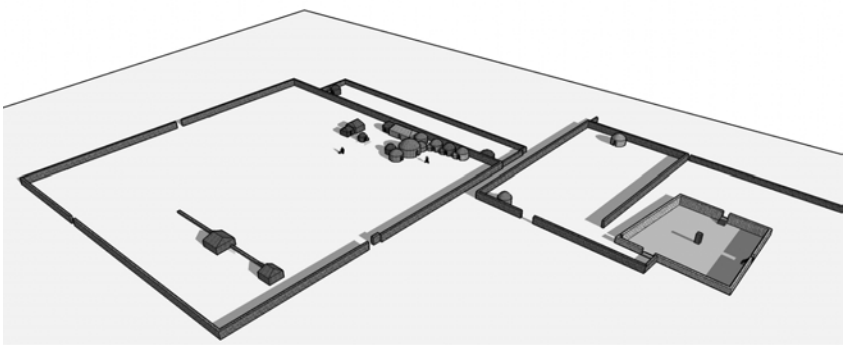

FIGURE 3.21 Reconstruction of Phase 5 built environment, facing southeast. Note the newly constructed passage connecting the southern compound to the sector 2 sunken court.

the sunken court. Additionally, a large canal that drained the Central Plaza was constructed. This canal ran under the southern compound wall and exited off the southern edge of the Principal Mound. Phase 5 dates to Late Formative 1 based on associated ceramics.

Phase 6

During Phase 6 several structures were abandoned, and three large earthen platforms were constructed within the eastern (strs. 12.G1, 12.G2) and southern (str. 6.G1) compounds (figs. 3.22, 3.23). Additionally, two platforms were added to the western area of the site, defining the final variation of the Central Plaza (str. 7.B1) on the western side. In the south, the earthen platform (str. 6.G1) was constructed directly overlying the southern two-thirds of the compound. This platform was constructed directly adjacent and to the east of the original southern platform (str. 2.G1), effectively extending the southern platform to the east. In the eastern compound, two platforms were constructed, and an earth resistance survey conducted in this area revealed the probable presence of a sunken court cut into the top earthen platform (str. 12.T1).

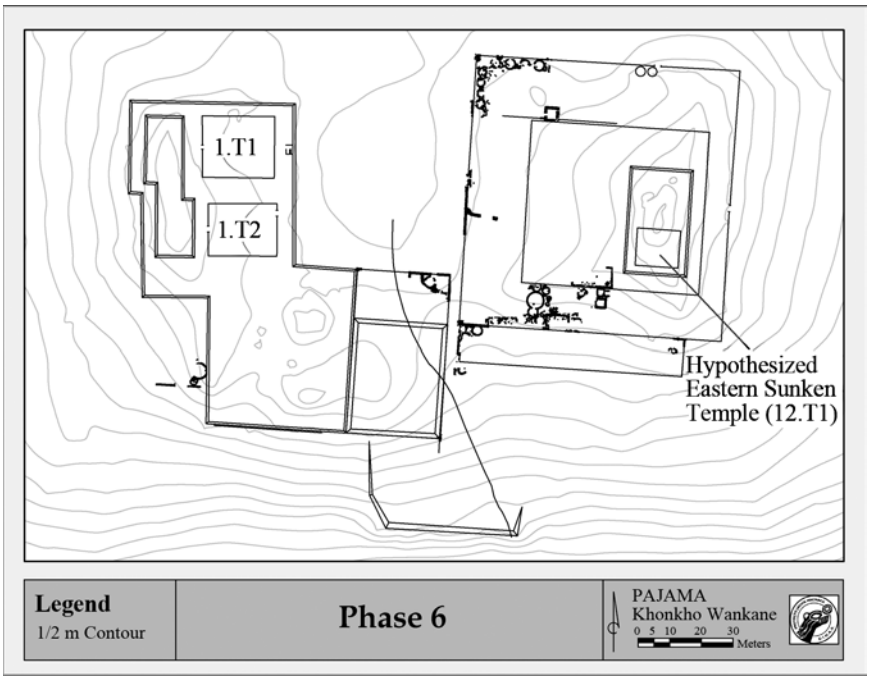

FIGURE 3.22 Plan of Phase 6 architecture.

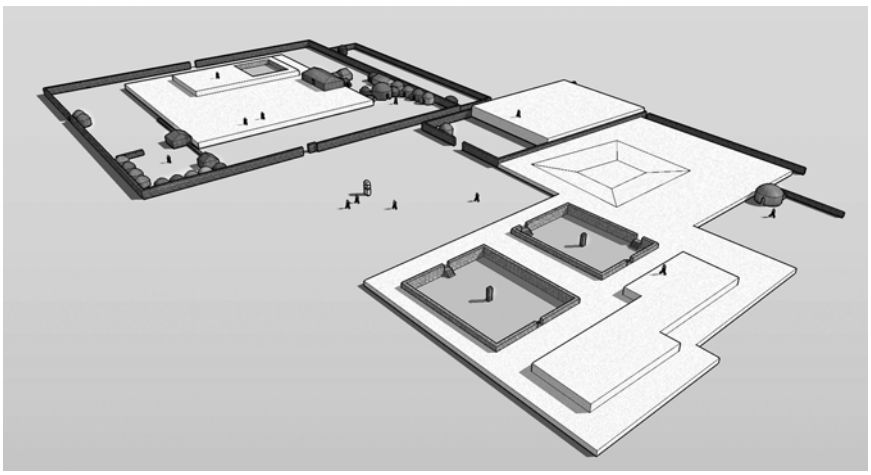

FIGURE 3.23 Reconstruction of the Phase 6 built environment, facing southeast.

In the west, two earthen platforms were constructed and bounded by a large wall (str. 1.W1). Two sunken courts (strs. 1.T1, 1.T2) were constructed on the lower basal platform. These two new Phase 6 sunken courts, square in shape, were constructed at the same time that the original Phase 4/5 sector 2 sunken court (str. 2.T1) was abandoned. Additionally, in the south an earthen terrace was constructed during Phase 6.

In sector 12 several large hearth features were constructed in or near the entrances of formerly occupied structures. These structures continued to exist, but their function seems to have changed significantly. Figure 3.24 shows two of these hearths and their relationship to the earlier structures. Ceramics recovered from Phase 6 contexts date the phase to Late Formative 2 (~AD 250–500).

Phase 7

Phase 7 is represented by a resurfacing of the eastern platform and the abandonment of the large rectangular structure (str. 12.R2) constructed during Phase 6. Distinct evidence of Phase 7 was only encountered in excavations in the southwest area of sector 12, during the excavation of structure 12.R2. Phase 7 also dates to Late Formative 2.

Tiwanaku IV Phase

At this point very little Tiwanaku material has been recovered from the Principal Mound. The Dual Court Complex continued to be used during the Tiwanaku period, but the majority of the domestic structures showed very little evidence of Tiwanaku habitation. In the northern sections of the mound several Tiwanaku burials have been excavated, and there is evidence that at least one domestic structure in these areas was inhabited during the Tiwanaku period. On the Putuni Mound, northeast of the Principal Mound, evidence was recovered for Tiwanaku IV occupation. It is unclear at this point when the actual Putuni earthen platform (str. 10.G1) was constructed.

DISCUSSION

The reconstruction of the architectural phases of Khonkho Wankane highlights several interesting changes in spatial organization during the habitation of the site. First, the transition between Phase 3 and Phase 4 is, in all likelihood, highly significant. During Phase 4 the residents of the site developed an inclination to divide up spaces that were previously open. Additionally, during Phase 4 both the Central Plaza and the sector 2

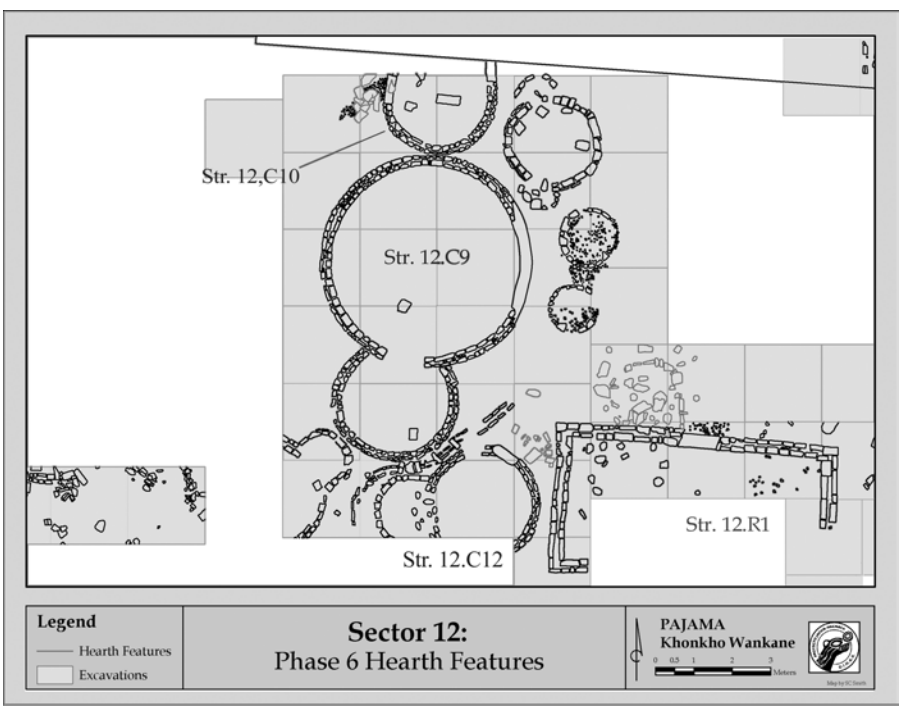

FIGURE 3.24 Sector 12, showing Phase 6 hearths constructed in the entrances to earlier buildings.

sunken court were defined. These are both ceremonial-type spaces; however, the Central Plaza is distinctly more public and, as such, implies a different type of interaction and behavior (Hall 1966; J. Moore 1996a). During Phase 5 the residents of the southern compound seem to have attained some sort of privileged access to the sector 2 sunken court. It is significant that during the ensuing Phase 6, use of this court declined significantly and the Dual Court Complex was constructed.

Phase 6, which dates to the Late Formative 2, brought several extensive changes to the overall spatial organization of Khonkho Wankane. Most notably, the three large earthen platforms were constructed. These constructions seem to indicate a new interest at the site in changes of elevation (Janusek 2006). For example, upon entering the site from the west, a visitor would first ascend the platform and then descend through the western entrances into the sunken Dual Court Complex. Further, while the axis of movement relative to the sector 2 sunken court was north–south, the main access to the two Late Formative 2 sunken courts was from the west. Additionally, these platforms provided a new and different venue for publicly visible ceremonial activities.

The main focus of this chapter has been to present data related to the form and timing of architectural construction at Khonkho Wankane. My hope is that analyses of changes in spatial organization at Khonkho Wankane during the Late Formative period will provide one line of evidence toward the reconstruction of sociopolitical dynamics during this crucial period preceding the emergence of the Tiwanaku state (see S. Smith 2009 and S. Smith, forthcoming).

ACKNOWLEDGMENTS

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NOTE

1 Due to space constraints, detailed maps are provided for only the key structures mentioned in the text. The reader is referred to S. Smith 2009 for detailed maps of all the architecture recovered at Khonkho Wankane.

Chapter 4

Excavations of a Late Formative Patio Group at Khonkho Wankane, Bolivia

Erik J. Marsh

From 2001 to 2007, Proyecto Jach'a Machaca organized excavations in ritual and residential spaces at Khonkho Wankane (hereafter Khonkho), a Late Formative (200 BC–AD 500) ceremonial center in the southern Lake Titicaca Basin (fig. 4.1). Archaeologists have identified similar ceremonial centers in the region (Stanish 2003), but few have seen extensive excavation. This preliminary report describes the 2004–7 excavations of sector 7 at Khonkho, where portions of fifteen structures were uncovered (figs. 4.2, 4.3). To date, this patio group is the single best-preserved Formative domestic context in the region. These structures' well-preserved foundations were defined by cut stones and large entrance blocks. The defined spaces include evidence for domestic activities such as cooking, food processing, weaving, and ceramic production (see Marsh 2012, chapter 6). Situated around an open patio paved with small stones, this patio group was enclosed by a large compound wall, severely restricting access to other compounds, the adjacent Main Plaza, and the three temples. Two radiocarbon dates establish that the occupation of the patio groups was around AD 400. It was part of Khonkho's last phase of primary occupation, only a few generations before the emergence of Tiwanaku around AD 500.

Khonkho and Sector 7

The Machaca region is located south of the Tiwanaku valley, separated by the Quimsachata range (fig 4.1; Janusek, chapter 2, this volume). In this region, survey has identified a number of Late Formative sites, but Khonkho is both the largest and the only one with monumental architecture (Lémuz Aguirre 2001, 2006, 2011). At Khonkho, Late Formative occupants built an artificial mound with local clays. Atop this mound, they used stones from the nearby Quimsachata range to erect carved stelae and three temples (Janusek 2004b, 109; Janusek, Ohnstad, and Roddick 2003; Ohnstad 2011). Additional cut stones were part of numerous wall constructions, which defined enclosed complexes as well as smaller houses and domestic structures. While only a small population probably lived at the site, an enormous amount of labor was coordinated to build Khonkho, representing a series of construction projects carried out on a larger scale than at any other site up to this point (see Marsh 2012, 445–46).

Excavations at Khonkho identified three temples built around the Main Plaza (Janusek 2005; Janusek and Plaza Martínez 2006, 2007, 2008).[1] Excavations during the 2004 field season revealed portions of compound K3 in the northeast corner of this plaza (fig. 4.2). These excavations, directed by Sonia Chacaltana, John Janusek, and Scott Smith, identified the western wall of compound K3 and the circular structures of sector 7's patio group, in units 7.7 to 7.15 (fig. 4.3). These excavations began to reveal a patio group enclosed within the northeast corner of compound K3 and outlined the general pattern for further excavations (fig. 4.4). Subsequently, I

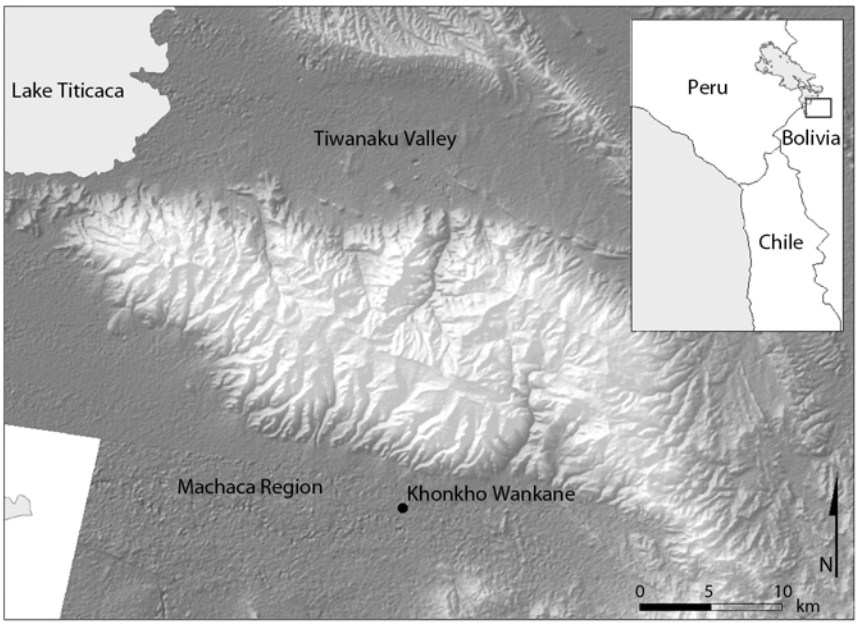

FIGURE 4.1 Map of the region, showing the location of Khonkho Wankane.

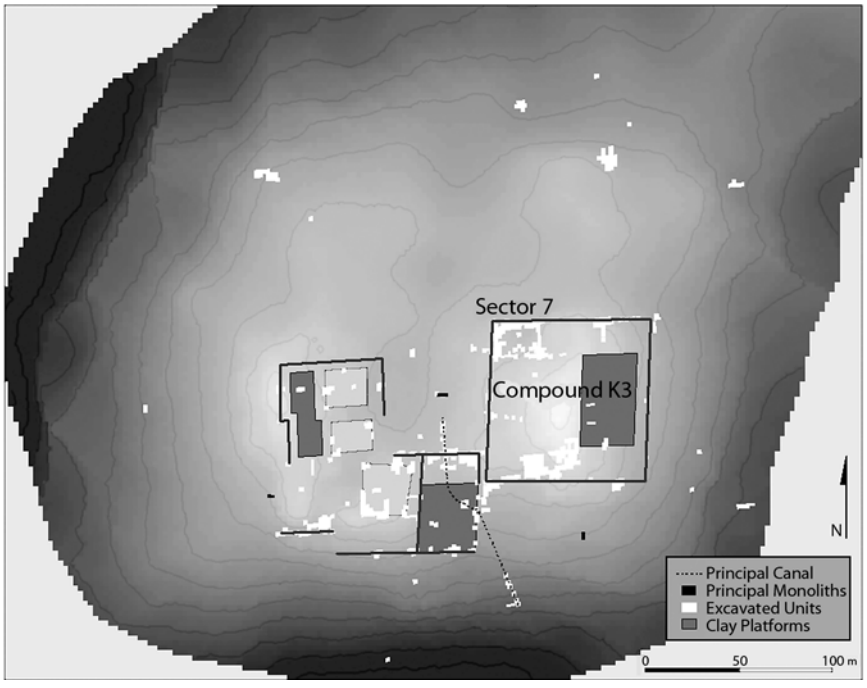

FIGURE 4.2 Map of Khonkho, indicating the location of sector 7 and compound K3. The site sits atop a low mound. Contour lines every 50 cm. *Base map by Scott Smith and Arik Ohnstad.*

directed excavations in this sector from 2005 to 2007 (Marsh 2006, 2007, 2008a).

Excavations in other parts of compound K3 have revealed that this large space was carefully segmented by walls and included diverse use areas (Gladwell 2006a; Marsh 2011; M. Pérez Arias 2006; S. Smith 2009, 110–13; 2011, 80–83, fig. 7; S. Smith and Pérez Arias 2007). The compound was enclosed by a large wall, which defined its form and size, about 83 by 84 m. Access to the compound and spaces within the compound appears to have been restricted. Only two possible entrances to compound K3 have been identified, despite extensive excavation along its perimeter.

EXCAVATIONS IN SECTOR 7

Most of sector 7 lies within a modern potato field, plowed by a tractor. The tractor's blade disturbed deposits to about 10 cm below the sur-

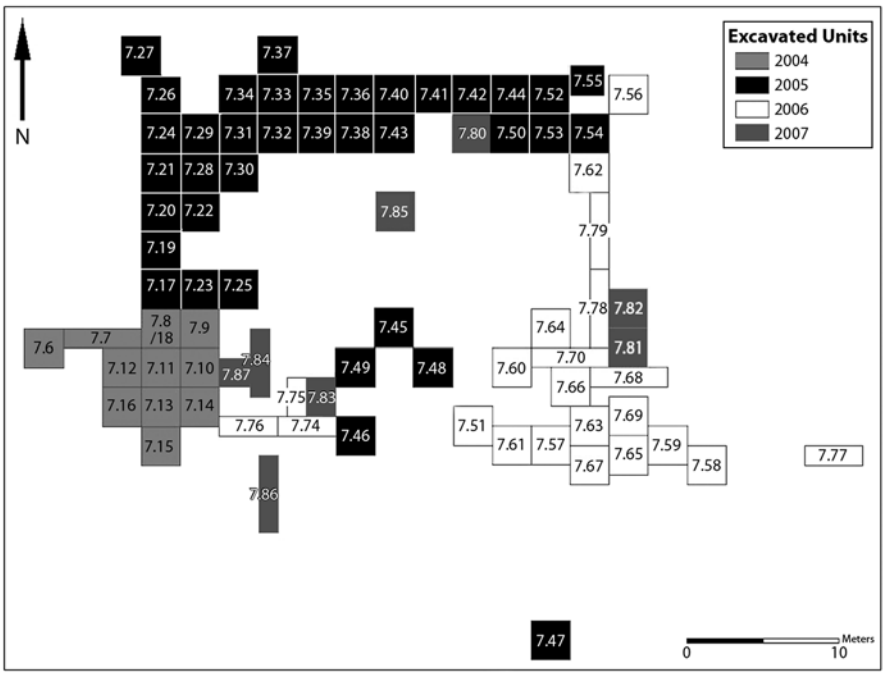

FIGURE 4.3 Units in sector 7, indicating the field season when each unit was excavated.

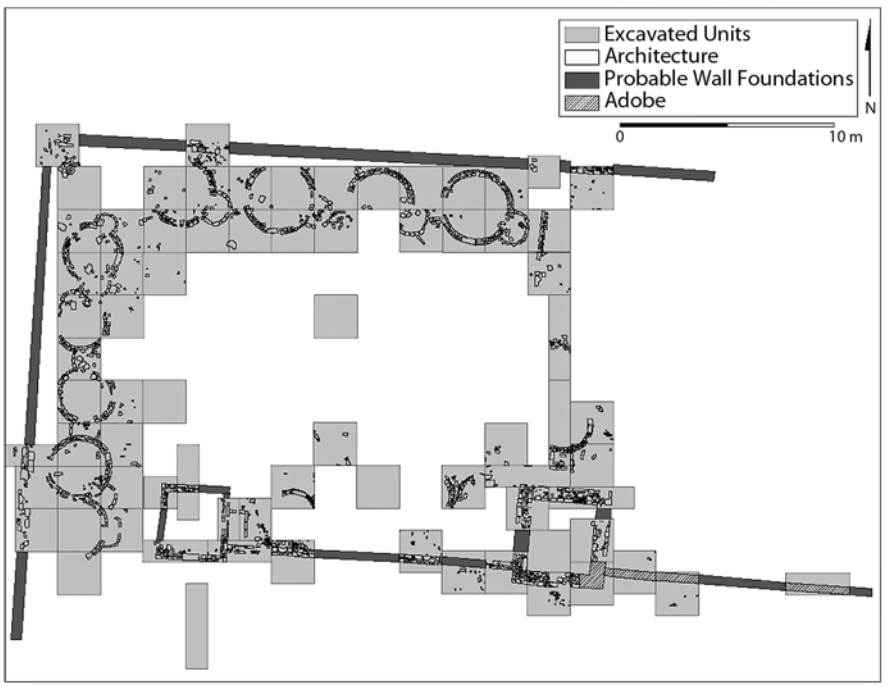

FIGURE 4.4 Architectural features in sector 7 (see also Marsh 2012, fig. 6.3).

face. According to the landowner, Alejandro Colmena, the tractor would have lifted its blade to pass over large rocks. We found corresponding tractor scars on the tops of the shallowest stones, which were generally too large for the tractor to move (see Marsh 2012, fig. 6.10). The field's soil (7.5YR 5/3) is mostly clay, probably the remains of melted adobe bricks or *tapia* (rammed earth) that once formed the walls and superstructures of buildings in sector 7. Approximately 10–15 cm below the surface lay the stone foundations of most walls and structures and the top of the organic, artifact-rich occupation stratum. This stratum was excavated to the compact clay layer and occupational surface of the structures and surrounding spaces. Later excavations suggest this clay was likely construction fill for a platform, placed below the stone foundations and living surface as part of the initial construction of sector 7.

Architectural Styles

The architects of Khonkho relied on few styles of wall construction and a limited number of forms. Except for the temples, nearly all stone foundations in Khonkho comprised two courses of cut stone, with fill placed between the courses. The doorway to each structure was marked by a large, flat, rectangular block placed over the stone foundation. The superstructure was built of adobe, likely either adobe bricks or tapia. The mud superstructure collapsed as a result of wind and water erosion, which are especially strong during the rainy season. In a few cases, parts of the superstructure were preserved. The melting of a single-story adobe structure probably took less than a hundred years (Goodman-Elgar 2008; McIntosh 1974).

The width of stone foundations for adobe walls suggests the practical limit of their height, up to ten times as high as the width of the foundation (see Marsh 2012, 363). Hence, compound walls may have reached up to 3 m, and circular structures were probably 1.5–2 m in height. In the absence of any recovered roofing material, roofs may have been constructed with thatch, made from the area's ubiquitous *paja* (straw), or conical in shape (see citations in Marsh 2012, 118–19; S. Smith 2009, 90–93).

Compound K3's walls were around 55–60 cm wide and were consistently aligned close to the cardinal directions, about 8 degrees east of north. This alignment was used elsewhere in the region and endured as an architectural standard at Tiwanaku for centuries. Compound K3 was subdivided by smaller walls, about 35–40 cm wide, following the same alignment. Within subdivisions of the compound, circular foundations, about 25–30 cm wide, were built in the same style. Many circular structures had an attached semicircular annex, or bin, which was usually made of only a single course of stones, 10–15 cm wide. Less formal walls used single courses, which connected adjacent structures and close off access to spaces between buildings. Thirteen of the fifteen structures excavated in sector 7 were circular, which appears to be the standard form for domestic structures at Khonkho. From the perspective of a person standing in the center of the sector 7 patio group, the patio would have been enclosed by undulating walls that were punctuated by entrances (fig. 4.4).

The Patio Group

In sector 7, circular structures were distributed around a paved patio area with restricted access. Each structure had a large stone entrance block, placed atop the structure's stone foundation, each oriented toward the patio. On the north and west, the patio group was contained by compound K3's large wall. To the south, another wall divided the patio group from the central part of the compound. This wall was punctuated by two square structures, whose entrances faced away from the patio group toward the central part of the compound. A large circular structure immediately north of the larger square structure also had an entrance block facing away from the patio group, to the east. Although excavations did not expose all of sector 7, the only known access to the patio group was through a 1.5 m gap west of the smaller square structure. About 10 m south, an opening in the compound wall was excavated by M. Córdova Palacios, but this was not a formal entrance. Both of these openings would have provided access but were relatively informal compared with other entrances to both ritual and domestic spaces at the site.

Square Structures

The two square structures followed the alignment of compound walls and were built in the same architectural style. These two structures connected the long wall that bounded sector 7's patio group to the south, separating it from the central part of compound K3. The smaller structure's foundation was similar in width to the circular structures, about 25–30 cm, but the larger structure's foundation was about 70 cm wide.

The large square structure in the southeast corner of the patio group was the most unusual structure in sector 7 (see Marsh 2012, 297–303). Its exceptionally wide walls were the widest at the site, but it had a relatively small interior space, 3.1 by 3.3 m. This configuration would have allowed for an especially high adobe superstructure, which

would have towered over nearby structures. However, no direct evidence for building height has been found at this structure or anywhere else at Khonkho. The entrance to the structure was not marked by a stone block but instead by an opening in the foundation. The occupational surface of this structure began at the depth of the entrance to the south and sloped up, about halfway into the structure. It appears this structure was not domestic in nature. Compared with other structures in sector 7, the occupational surface was relatively clean of artifacts. Ceramics from the floor included a relatively high percentage of Kalasasaya-style serving vessels. To the south, the entrance area was paved with small river stones. Similar to other entrances, the area immediately in front of the entrance was paved more extensively with larger stones. Areas away from entrances were paved more sparsely with smaller stones. Areas paved with gravel over compact clay surfaces may have been intended to drain rainwater, like many other architectural features at the site (Marsh 2012, 304–7).

The two square structures and the connecting wall may have been built prior to the circular structures to the north. A wood sample from the occupation floor of the large structure was radiocarbon dated to AD 244–343 (1 sigma; sample K020).[2] Two carbon samples from the occupational stratum from two circular structures were both dated to AD 340–429 (1 sigma; samples KW012 and KW013).[3] It appears the patio group was added to Khonkho after the initial construction of compound K3 (S. Smith 2009). The southern-facing square structures and the especially long wall connecting these structures suggest it may have been the original northern wall of compound K3.

Use of Space

The architectural layout of sector 7 is very regular, and in most annexes there is evidence for cooking. Sherds from cooking vessels and fragmented animal bones were found within dense ash layers, suggesting that these areas were used for cooking. In one annex, we recovered river stones from nearby streambeds, placed in such a way that would have supported an olla above a fire. These annexes had especially dense quantities of artifacts (see Marsh 2012, chapter 6). Other less formal cooking areas were also made by modifying original structure walls (fig. 4.5).

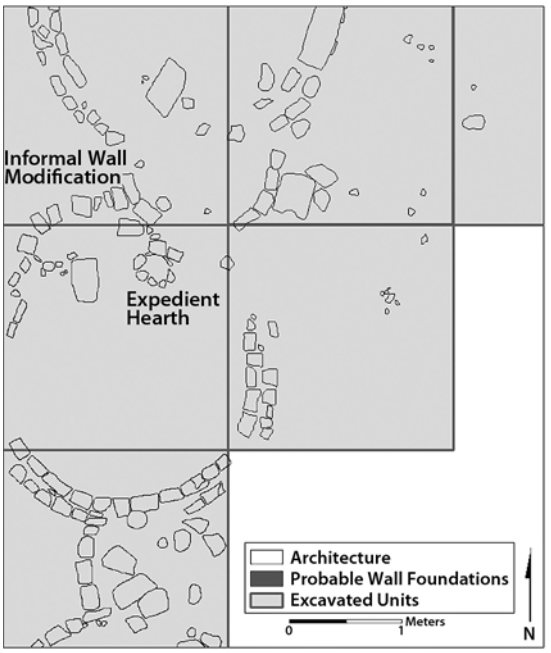

FIGURE 4.5 Detail of structures along the western wall of compound K3 and an improvised hearth.

ARTIFACTS

Many of the artifacts recovered in sector 7 bear strong resemblance to the few other Late Formative domestic contexts known in the region. The densest concentrations of artifacts were found in the smallest spaces, for example, against the inside of the compound wall and within the semicircular annexes attached to the structures. The material assemblage is dominated by ceramics and camelid bones. Most ceramics were utilitarian, and most contexts had a minority of sherds from Kalasasaya-style serving vessels. Camelids dominate the faunal assemblage, but there are also bones from deer and smaller mammals, such as viscacha and *cuy* (guinea pig). Much smaller quantities of fish bones, bird bones, and eggshell were also recovered, reminiscent of contexts at Kala Uyuni, on the Taraco Peninsula (K. Moore et al. 2007). Randi Gladwell and Alejandra Gasco are analyzing the macrofauna; James Pokines (2012) has analyzed some of the

microfauna. This sector had more groundstone than any other area of the site, reinforcing the suggestion that it was an area of intense food production (Garrison 2008). Less common artifacts included stone and ceramic labrets, *tupus* (pins), a bronze button, basalt hoes, chert and obsidian bird darts, and bone tools.

Ceramics

The ceramics share many of the features of Late Formative utilitarian sherds found elsewhere in the region, and many have micaceous pastes (Lémuz Aguirre 2001). Another type represented here has orange pastes and punctations around the vessel neck. Kalasasaya-style serving vessels were present in smaller quantities throughout the sector, similar to those known from Tiwanaku (Janusek 2003b; Ponce Sanginés 1961, 1981, 1993), sites on the Taraco Peninsula (Bandy 2001; Roddick 2009; Steadman 2007), and others in the Katari valley, such as Lukurmata (Bermann 1994; Janusek and Kolata 2003). It seems this style was widely used, and most production was local (Roddick 2009). Notably, no Qeya-style sherds were recovered, confirming that this style, while dating to the latter part of the Late Formative, is nearly always restricted to ritual and ceremonial contexts (Janusek 2003b, 2004b; Mathews 1992).

Lithics

The most common lithic items recovered were groundstone, *batanes* (metates) and handstones (manos), projectile points, and slate hoes. Compared with other sectors at Khonkho, there is an especially high density of groundstone in sector 7 (Garrison 2008; Garrison and Marsh 2008). The ubiquity of groundstone suggests this was a place of primary food production. A total of fifty-eight groundstone artifacts were recovered, with as many as fourteen in a single unit (7.80). Chipped-stone artifacts included expedient cutting and scraping tools, mostly of local, low-quality chert and quartzite. Small projectile points were also recovered, made from much higher-quality cherts and obsidian. These finely worked points measure less than 3 cm in length and would have been effective for hunting birds and small game. Finally, basalt hoes were found in the lithic assemblage; these might have been used as either agricultural tools or for shoveling clay for construction or agricultural activities.

Lithics from other sectors of Khonkho have been geochemically sourced, providing preliminary expectations for pending analysis of lithics from sector 7. Obsidian comes from five sources, predominantly Charaña, located 100 km to the southwest, and Chivay, located 350 km to the northwest. All twenty-two basalt samples analyzed were found to come from the Querimita quarry 300 km to the south (Giesso 2000, 2003, 2006, personal communication).

Worked Bone

Over thirty bone tools were found in sector 7, including *wichuñas* (weaving tools), *chinchas* (deer antler tools), needles, and beads (Gladwell 2006b, 2007). Other worked bones were shaped into points or edges, but the function of these artifacts is not clear. Wichuñas were the most common bone tool, made from camelid metapodials. Similar tools have been found in many domestic contexts in the region. Chinchas, used to prepare agricultural soil for seeds, were also recovered. These have also been found elsewhere in the region, including Lukurmata (Bermann 1994, 106).

Jewelry

Several items of adornment were recovered, including labrets, tupus, and a bronze button. Labrets at Khonkho are shaped like wing nuts, made of stone, metal, or fired clay, and were usually worn as a piercing below the lower lip, as suggested by an in situ labret found in a burial near the southwestern corner of compound K3 (Cable and Beebe 2006). Tupus were probably used to secure a shawl wrapped around the shoulders. A square bronze button was found in unit 7.49 (see Marsh 2012, fig. 6.15).

Regional Comparisons

Preliminary results presented here suggest similarities to other domestic contexts in the region (see Marsh 2012, chapter 3). A number of Wankarani

structures have been excavated in central Bolivia (A. Pérez Arias 2005; Bermann and Castillo 1995; Fox 2007; McAndrews 1998; C. Rose 2001) that are similar to structures at Khonkho (Marsh 2008b). While Wankarani structures were occupied much earlier than structures at Khonkho, similar ceramics have been noted between the two regions (A. Pérez Arias 2007), and gaps in the regional radiocarbon chronology leave open the possibility of a northern emigration from the Wankarani area (Fox 2007, 250; see discussion in Marsh 2012, 59–62). There are much stronger similarities to domestic occupations at nearby Late Formative sites, such as Kala Uyuni (K. Moore et al. 2007), Lukurmata (Bermann 1994), and Tiwanaku. At Tiwanaku, Late Formative domestic occupations with circular structure foundations have been found in the Kk'araña and Kalasasaya sectors (Janusek 2004b; Ponce Sanginés 1995). After the Late Formative, many domestic patterns endured through Tiwanaku IV and V (Couture and Sampeck 2003; Escalante Moscoso 2003). Further research will evaluate the extent of these similarities and local historical trajectories of domestic practices (see Marsh 2011, 2012).

Conclusion and Summary

Four field seasons of excavation in sector 7 at Khonkho revealed parts of fifteen domestic structures surrounding an open patio area. The consistency of architectural forms suggests these structures were built as part of a larger plan and reflect well-established building practices and traditions. The scale and regularity of the architecture suggests a large amount of labor was organized and directed in the creation of domestic spaces at Khonkho. Ongoing research will address the relationships between the residents of sector 7, those who performed rituals at adjacent temples, and those who built the extensive architecture. Within the patio group, artifacts suggest this area was a domestic occupation, which was dated to around AD 400. This occupation falls toward the end of the Late Formative, when dramatic social changes were occurring around the Lake Titicaca Basin. Further research in domestic contexts from this period will shed light on the Late Formative's dynamic social order and the role of household organization in the emergence of state-level complexity at Tiwanaku in the following generations.

Acknowledgments

I am grateful to the members of the community of Qhunqhu Liqiliqi, who graciously offered their hospitality and support. I thank the *maestros*, with whom it was a privilege to work, and to the rest of the community who participated in the excavations. Thanks to John Janusek for organizing an excellent project and to its many members and visitors over the years. The project was supported by the Curtiss T. and Mary G. Brennan Foundation, a Vanderbilt University Discovery Grant, the Howard Heinz Foundation, the National Geographic Society (7700-04), and the National Science Foundation (BCS-0514624). The Department of Anthropology at the University of California, Santa Barbara, provided travel funds for the 2005 and 2006 field seasons.

Notes

1. All four project reports are available online at: *http://khonkhowankane.org/site_reports.htm* (accessed 5 February 2013).
2. Radiocarbon dates were calibrated with OxCal 4.1 (Bronk Ramsey 2009) using the IntCal09 calibration curve (Reimer et al. 2009). Complete information on carbon samples and Bayesian modeling of dates from Khonkho are available elsewhere (Janusek 2011, table 1; Marsh 2011, table 1; 2012, tables 5.6, 5.7; S. Smith 2009, table 3.1). Sample KW020 is carbon, taken from a floor context, and has a median of AD 301. The complete 2 sigma span covers AD 182–408, and 95 percent of this range spans AD 214–408.
3. Sample KW012 is a carbon sample from the gravel floor outside of the structure and has a median of AD 395. The complete 2 sigma span covers AD 259–533, and 78 percent of this range spans AD 322–466. Sample KW013 is also carbon and has a median of AD 394. The complete 2 sigma span covers AD 259–533, while 78 percent of this range spans AD 320–464.

Chapter 5

The Stone Stelae of Khonkho Wankane: Inventory, Brief Description, and Seriation

Arik Ohnstad

This chapter focuses on the stone sculpture of Khonkho Wankane (hereafter Khonkho). Related to the Formative Titicaca Basin's "Yaya-Mama" tradition (Chávez and Chávez 1975), and also having been assigned to David Browman's somewhat more expansive "Pajano" tradition (Browman 1974, 1997a), Khonkho's stelae present some of the most intricate stone imagery from the Formative Titicaca Basin. They are unquestionably of great value for the refinement of regional stone sculpture chronology, the study of cultural/stylistic interaction across the Titicaca Basin (and beyond), and the interpretation of the contexts and meanings of Late Formative ritual.

The primary goal of this chapter is to present full drawings and descriptions of all the carved stelae from Khonkho. Using this iconographic data and data from Proyecto Jach'a Machaca's excavations, I outline cross-ties between the motifs and styles with imagery in stone and other media, and use this information to seriate the stelae. I suggest that Khonkho's stone stelae can be placed quite firmly in the overall sequence of stone sculpture in the Titicaca Basin (particularly the southern basin) and that they enable us to anchor an important segment of the sequence of Formative sculpture in absolute chronological terms.

Drawings and Descriptions of the Sculptures

The stone stelae from Khonkho have been previously described in numerous publications (e.g., Portugal Zamora 1941; Posnansky 1945; Rydén 1947; Vellard 1955; Mesa and Gisbert 1966; Browman 1972; Portugal Ortiz 1998). However, because the few drawings that have been published have generally been incomplete and often incorrect, the monoliths have never been fully accessible to scholars. I attempt to rectify this situation by presenting complete drawings of each of the stone stelae at Khonkho, compiled from photos and rubbings made in 2002, personal observation, and from older photos taken during the investigations led by Maks Portugal Zamora. These are the most accurate and detailed images of the stone sculptures yet published.

All the stone stelae from Khonkho appear to have been associated with the site's core monumental zone (fig. 5.1), although three of the four monoliths were found just outside of it. Stelae 1 and 2 were found intact but exposed on the eastern and southern flanks of the mound, while stela 4 seems to have been broken and likely buried in antiquity just to the west of the site's Dual Court Complex. Stela 3, however, appears to remain more or less in situ in the sunken courtyard/plaza area at the center of the site core.

The Khonkho stelae are all carved from sandstone, three of them from a red sandstone, and the other (stela 3) from a grayish stone; this likely has chronological implications. All the stelae are crafted in a similar style. Like other stone stelae of the Pajano/Yaya-Mama style (see Browman 1974, 1997a; Chávez and Chávez 1975), they are executed in low relief, with very little three-dimensional modeling. In rare instances, simple

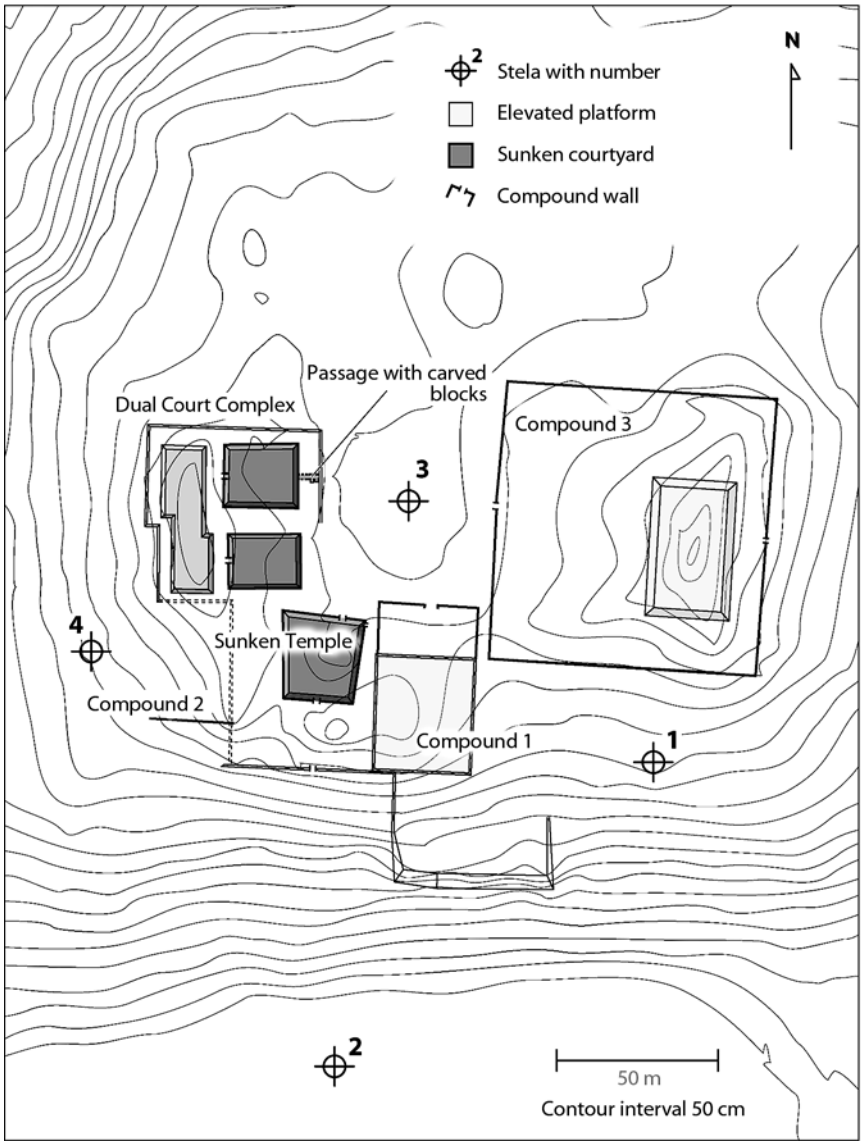

FIGURE 5.1 Simplified map of Khonkho Wankane, with major architectural forms and stone stelae shown. *Map by Scott C. Smith and Arik Ohnstad.*

incision is used to inscribe details. The relief generally produces two "flat" levels—a ground and a raised zone—which are marked in the drawings that accompany this chapter: recessed areas are shown using stippling, while raised relief areas are in outlined white. The numbering of the stelae in the descriptions below follows that assigned by Rydén (1947).

Following other treatments of Pajano/Yaya-Mama stone sculpture, the four faces of the Khonkho stelae are referenced in terms of the main humanoid figure. The face on which that figure appears is called the "front," the side toward the figure's notional right is called the "right," the side opposite the front is called the "rear," and so on. In the case of stela 4, which has been reconstructed from five fragments, the faces of the stone have also been numbered with roman numerals to indicate that the front/rear/left/right designations are not perfectly clear.

Stela 1 (Wila Kala)

Stela 1, the Wila Kala ("red stone" or "blood stone"), is shown in figure 5.2. It was probably laid in antiquity very near where it is currently found, on the southeastern flank of the mound (see fig. 5.1). The rear panel of the monolith was exposed to direct weathering for hundreds of years, since it is entirely eroded; the remaining three faces of the quadrangular Wila Kala are well preserved, although the sides are somewhat

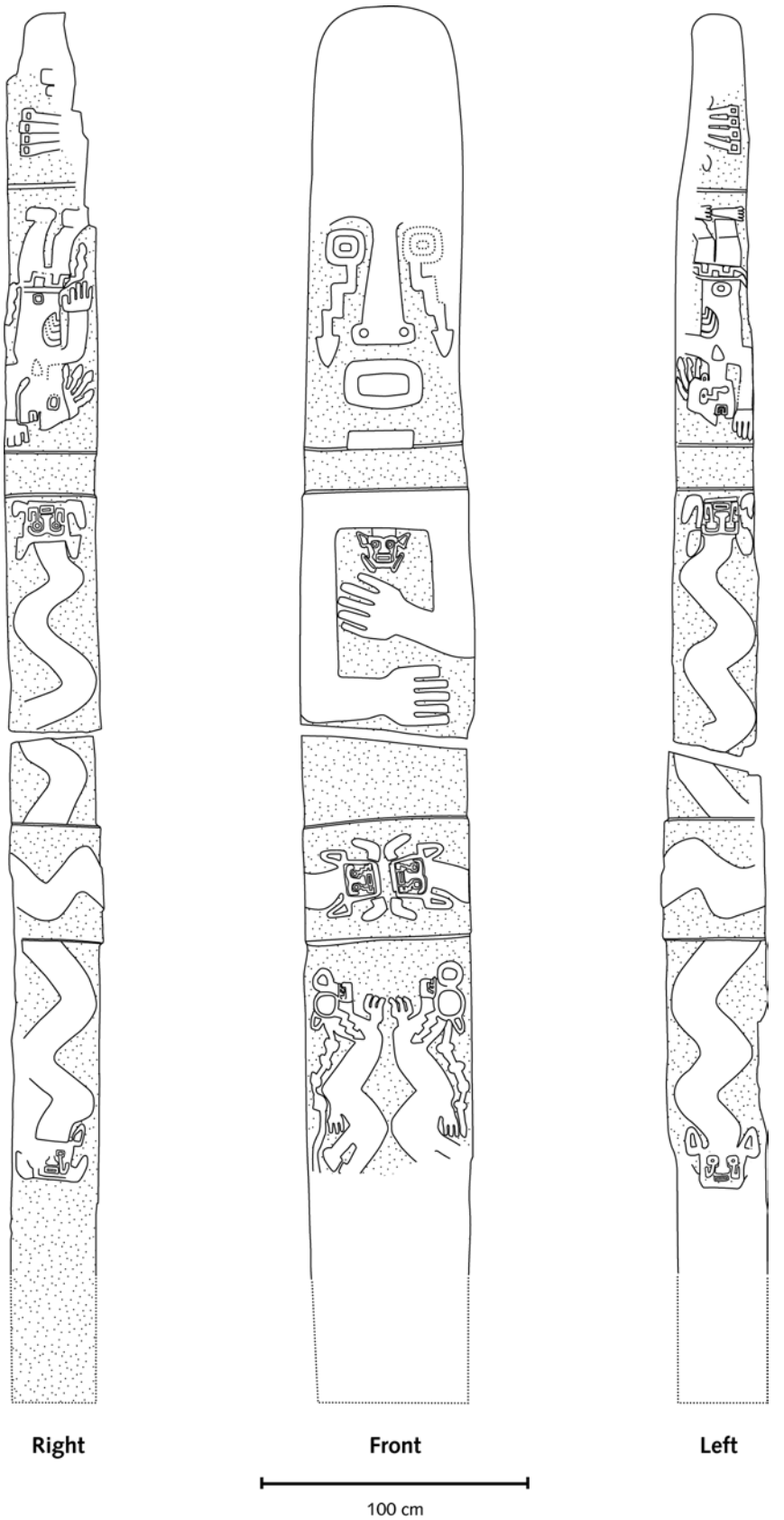

FIGURE 5.2 Stela 1 (Wila Kala). *Drawing by Arik Ohnstad and Jenni Ohnstad.*

more weathered than the front, which was in contact with the ground. The Wila Kala, which was broken in two soon after its discovery in the 1930s, is the tallest of the Khonkho monoliths. Portugal Zamora gives 538 cm for the length (1941, 294), but the lower half of the monolith has since been erected and its base buried, so it is not possible at present to measure its length. Based on early photographs published by Portugal Zamora (1941), I estimate its length at about 528 cm; the slab measures 63 cm wide by 39 cm deep. The stela is rectangular in cross section, with rectilinear corners.

The front of stela 1 depicts an anthropomorphic figure with a trapezoidal nose connected to a well-defined brow, a mouth in the shape of a squared oval, and ringlike eyes with zigzag arrowheaded eye streamers. Although the stone above the face is worn away, the figure appears to be wearing a headdress with radiating elements, visible on the lateral faces of the stela. The neck of the figure is depicted as a recessed panel, above which is a small raised rectangle, perhaps depicting a lip plug or chin ornament.

The arms are crossed over the chest in the typical Formative manner (Browman 1972; Chávez 1975). The arms, collarbones, and shoulder girdle mark out a formalized boxlike shape. The figure's belt is represented by a raised panel, around which winds a bicephalic serpentlike creature, whose heads meet on the front of the monolith.

The same serpent creature appears to be depicted also as a simple head suspended over the pectoral region. Larger versions of the bicephalic serpent are found on the sides of the monolith, where they stretch from the neck panel to near the bottom of the stela, interrupted and crossed by the belt panel. These serpent beings, like those on stelae 2 and 4, as well as on the "Idolo Plano" from Tiwanaku (see fig. 5.8c), have heads marked by feline ears, "suche" (catfish) whiskers (suggested by Valcárcel 1935), and eyes with zigzag or recurved eye streamers.

Just above these serpents on each lateral face of the monolith are two mirrored profile figures, with bared teeth, distinctive headdresses/hairstyles, zigzag breechcloths, semicircular or triangular neck ornaments (or "wounds," see Frame 2001), exposed ribs, one trailing and one leading arm, and large, ringlike navels. These figures have very specific iconographic cross-ties with the "Falling Man" or "Backbent Figure" motif of Paracas textiles and ceramics (Browman 1972; Frame 2001), as well as with Pukara- and Pokotia-style statuary. Very similar "Falling Figures" appear in the same position on the sides of stela 2 (see below).

The two Falling Figures are balanced compositionally by two felines rampant at the bottom front of the stela. These creatures are more or less exact mirror images of each other, although it is interesting that the nose and eye of the feline on the right are about 40 percent larger than those on the left. The creatures have feline forelimbs but human feet. Zigzag, probably serpent-headed tear streamers emerge from these felines' eyes. Trailing from the back of each feline's head is a kind of ball-and-chain motif identical to one that recurs on camelids in Pukara ceramic iconography.[1] Some publications (Browman 1972, 1995, 1997a) show a circular element between the two feline figures. This is not in fact a relief carving but a very roughly circular pitting of the stone that is best interpreted as damage.

Photos taken before the monolith's base was sealed in concrete indicate a lack of carving below these figures.

Stela 2 (Jinchun Kala)

Stela 2, the Jinchun Kala ("eared stone"; fig. 5.3), is very similar in form and iconographic content to the Wila Kala. Like the Wila Kala, it is a long, quadrangular slab of reddish sandstone, with recessed and raised panels accentuating certain features of anatomy and costume. Also like the Wila Kala, the Jinchun Kala was found on the lower slopes of the mound, lying supine, in this case to the south of the central ceremonial precinct (fig. 5.1). The stela had probably lain in this position for centuries, since the exposed side (the front panel) was entirely worn away, while the other three sides were well preserved.

Since its discovery, stela 2 has been raised and a significant portion of its base set in concrete, occluding portions of the design (principally the serpents on the lateral panels). Portugal Zamora (1941, 294) reports the stone's length before it was set in concrete at 454 cm, while I have esti-

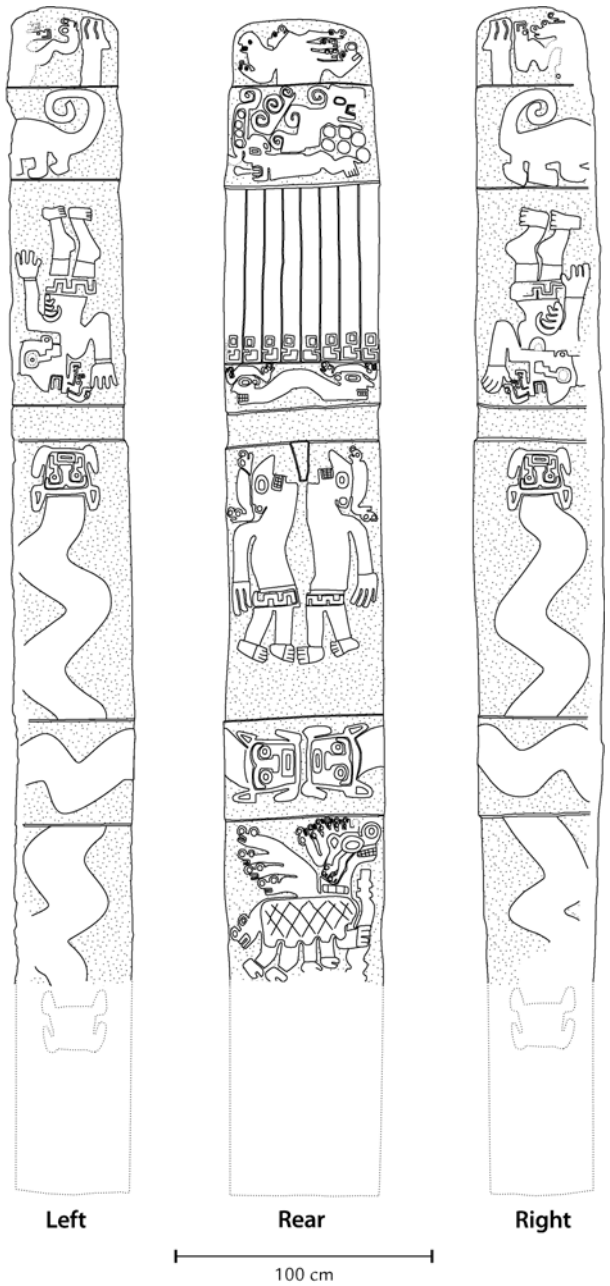

FIGURE 5.3 Stela 2 (Jinchun Kala).
Drawing by Arik Ohnstad.

mated the stone to measure 461 cm, using photos taken by Portugal Zamora. Maximal measurements of the width come to 63 cm, and depth to 48 cm.

The Jinchun Kala depicts a large, anthropomorphic figure similar to that depicted on stelae 1, 3, and 4. The flanks of the monolith are iconographically nearly identical to those of the Wila Kala: twin bicephalic serpentine creatures with the distinctively styled Khonkho attributes (eye markings, feline ears, and "suche" whiskers) are depicted below paired profile representations of the Falling Figure.

The front of the Jinchun Kala, and thus the stela's face, is not preserved. In a style similar to that used on later Tiwanaku period stelae, such as the Ponce monolith, the rear of the stela depicts hair (or possibly a headdress): long, straight streamers (tresses) terminating in animal heads. There are eight of these streamers, and they end in "fish" (*Orestias*) heads (suggested by Posnansky 1945); four of these face left, while the other four face right.

The tresses emerge from a raised panel that probably represents a kind of turbanlike headdress. On this is depicted an intriguing scene—unique in the corpus of Titicaca Basin sculpture—centered around a prone humanoid figure with various forms (including a legume that may represent tarwi) emerging from it. The lateral faces of this raised panel depict the profile bodies of felines with tightly curled tails.[2] The heads of these felines would have appeared frontally on the eroded side of the monolith, in the same manner as the felines at the bottom of Tiwanaku stela 15 (the "Bearded Monolith"; see fig. 5.8b).

The uppermost panel of the monolith depicts an amorphous shape emerging on a kind of wide but short stalk from the raised panel. The shape has a vaguely humanoid head and a number of appendages or rays terminating in feline heads. The sides of the same panel depict a similar though somewhat eroded design characterized by streamers terminating in feline and *Orestias* heads, paired with a motif showing three wavy feathers, very similar to a motif that commonly appears on Pukara ceramics associated with headdresses, staffs, and trophy head streamers and is more widely distributed on Late Formative textiles, where it is also generally associated with headdresses (fig. 5.4; see also Rowe and Brandel 1969, figs. 4, 9; Haeberli 2001; Young-Sánchez 2004, figs. 1.9, 2.20, 2.22, 2.25, 2.26, possibly 2.45). The same motif is also common in later Tiwanaku and Wari iconography.

In the middle section of the stela's rear appear twin humanoid figures, which are similar in composition to the paired felines on the front of

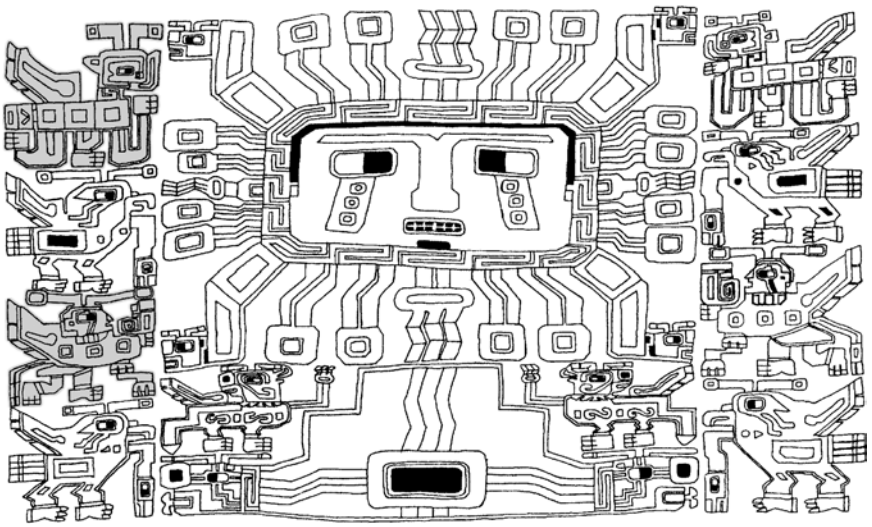

FIGURE 5.4 Late Formative period textile of the so-called Pukara Provincial style (Haeberli 2001). The figures discussed in the text are highlighted; note also the wavy feather or tassel motif. *Modified after Isbell and Knobloch 2006, fig. 12.4b.*

the Wila Kala. Like those felines, the paired humanoids face each other, with faces raised upward. The feet of these figures are depicted using a line just behind the toes to separate the foot into two zones, a common convention in Pukara ceramic representations, Late Formative textiles, and later Tiwanaku pottery (e.g., Burkholder 1997, fig. 7.12; Young-Sánchez 2004, figs. 1.9, 2.26). Likewise, the bicephalic feline headdress seen on these figures is a streamlined version of a style of headdress commonly seen in Pukara—and in Tiwanaku and Wari—representations.

Just above the upturned faces of the "Rising Figures," over the recessed neck panel, two identical profile humanoid heads, wearing the same bicephalic feline headdresses, are united into a single two-headed serpentine creature. The two heads of this being face outward, toward the side panels. Their gazes lead to the heads of the two Falling Figures on the lateral panels.

The Jinchun Kala's Falling Figures are very similar to those on the Wila Kala, with bared teeth, zigzag breechcloths, exposed ribs, semicircular neck ornament, and zigzag eye markings. The Jinchun Kala's Falling Figures also have three *Orestias*-headed streamers pendant from the chin, similar to those on certain figures in Pukara ceramics (e.g., Rowe and Brandel 1969, fig. 20; Chávez 1992, 204, 205, etc.). The Falling Figures on the sides of the Jinchun Kala are, like those on the Wila Kala, located just above bicephalic serpents whose sinuous trunks abut the raised belt panel. As on the Wila Kala and the Tata Kala (stela 3), a similar bicephalic serpent wraps around the belt panel.

Below the belt panel on the rear is a representation of a winged cameloid creature. This figure shares most of its basic iconographic elements with representations from Pukara-style ceramics and stone sculpture (e.g., Chávez 1988, fig. 12; 1992, figs. 143, 176), including the dual-perspective style for depicting the toed feet, the colored (here, crosshatched with incised lines) coat serrated along its lower boundary, the round nose, the mane on the crown of the head, and the lozenge on the neck. However, the Jinchun Kala figure also has bared teeth and feline-headed streamers from its eyes. Both of these features can be found on a "Pukara-style" sculpture from Hacienda Sawa Sawa, Livitaca, Perú (Chávez 1988, fig. 12), but the Jinchun Kala camelid also has a wing, mane, and tail that terminate in feline heads, as well as a fifth limb, with humanoid fingers and elbow joint. This hand is shown gripping a notched staff nearly identical to that carried by a number of representations of the so-called Camelid Woman on Pukara ceramics (e.g., Chávez 1992, figs. 142–45).

Stela 3 (Tata Kala)

The Tata Kala (fig. 5.5) is the most massive of the known Khonkho monoliths, although it is shorter than the Wila Kala: maximal measurements

are 510 cm long, 99 cm wide, and 67 cm deep. Tata Kala, translated by Portugal Zamora as the "priest stone" ("stone monk" or "father stone" would also be appropriate translations), is today the most revered of the monoliths and a centerpiece of ritual for the community and the region (Choque Canqui 2003).

The Tata Kala stood upright in Khonkho's sunken central plaza for centuries (fig. 5.1), although it has now slumped to the ground. Nearly all carvings on its surface have eroded away, due to severe weathering, but it is still clear that stela 3 differed in form from stelae 1 and 2. The stone is indented above the "shoulders" to create a head that is squared off and markedly stepped in from the shoulders. This rectilinear separation of the head from the body is common in Classic Tiwanaku statuary (where it is also accompanied by more three-dimensional modeling of the head).

The Tata Kala clearly depicts an anthropomorphic being with arms crossed over the chest; traces are visible of the right arm. It probably formed a squared-off shoulder girdle like that of stela 1, and the left arm would have been crossed over the right. A dangling ornament is just visible on the right side of the head, and a raised panel representing headgear was also present. The belt area on the stela's left side is fairly well preserved and also suggests that the stela was divided into rectilinear panels as were stelae 1 and 2. A portion of the body of a serpentlike being is visible on the left side of the belt panel.

Most interesting are the figures toward the base of the stela. Unlike the Wila Kala, the Tata Kala does not feature mirrored beings on its lower front panel; instead, there is a winged creature in a pose similar to that of the llamoid creature on the rear of the Jinchun Kala. The figure's body is formed by a lozenge that enclosed four circles or eroded rings. These are the elements that Portugal Zamora mistook for "traces of circles in low relief, arranged like those of the Bennett Monolith; that is, over the skirt" (1941, 296, my translation). The lozenge rests on two humanlike legs that are bent at the knee. A shape, perhaps a trophy head, dangles from an outstretched hand, and the figure also sports a dorsal wing. All in all, the figure is quite reminiscent of figures from a Late Formative textile that has been carbon-dated to between AD 200 and 400 (fig. 5.4), sharing with them the profile view, the lozenge-shaped body with a row of circular shapes, the outstretched hand, and the dorsal wing. A ringlike tail may also be shared with the figure in the upper left of figure 5.4. These creatures are chimeras, combining elements of humans, animals (birds, fish, felines), and insects, and are present in various forms on Late Formative period pottery and textiles throughout the basin, including on Pukara and Qeya ceramics.

The large ring that terminates the tail of this creature wraps around the right side of the stela, and on this side traces of another figure can be seen. The carving is difficult to interpret, although a downward-pointing hand or foot shows reasonably clearly. It may be that figures similar to the one on the front of the monolith were found on each of the four sides. If so, this would have been

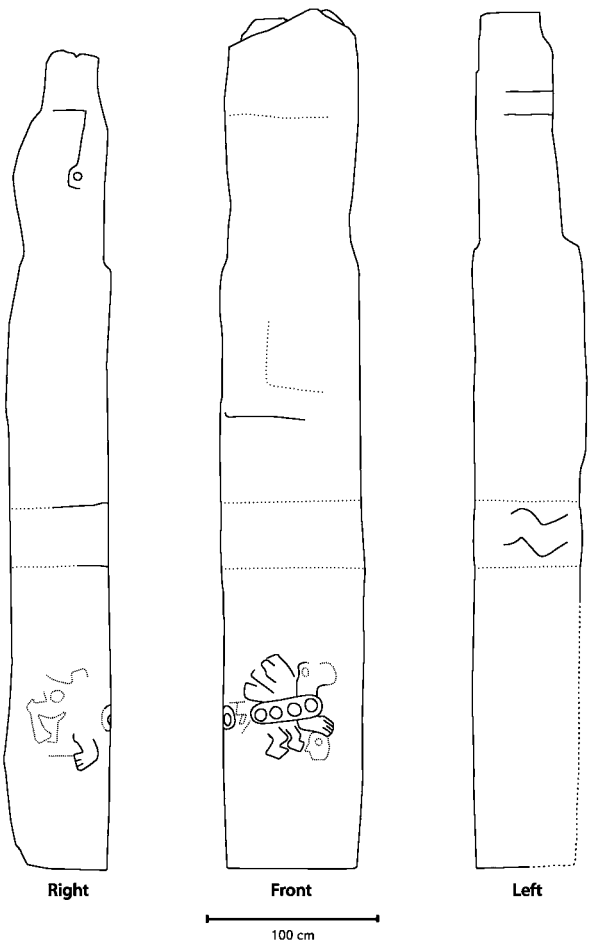

FIGURE 5.5 Stela 3 (Tata Kala). *Drawing by Arik Ohnstad.*

a unique patterning in the known corpus of Pajano-style sculpture.

stela 4 (Portugal Stela)

The fragmentary fourth monolith (fig. 5.6) was recovered by Portugal Zamora during his 1941 excavations. He described it briefly alongside a rather poor photo (Portugal Zamora 1941, 296), but the stela has remained essentially unpublished until today. The drawings included here are, to my knowledge, the first ever published.

Stela 4, or the Portugal Stela, seems to have been found buried at least 20 cm beneath the ground surface (Portugal Zamora 1941, 297; 1955, fig. 10) on the western side of the ceremonial core (fig. 5.1). Unfortunately, Portugal Zamora's publications do not indicate where or in what deposi-

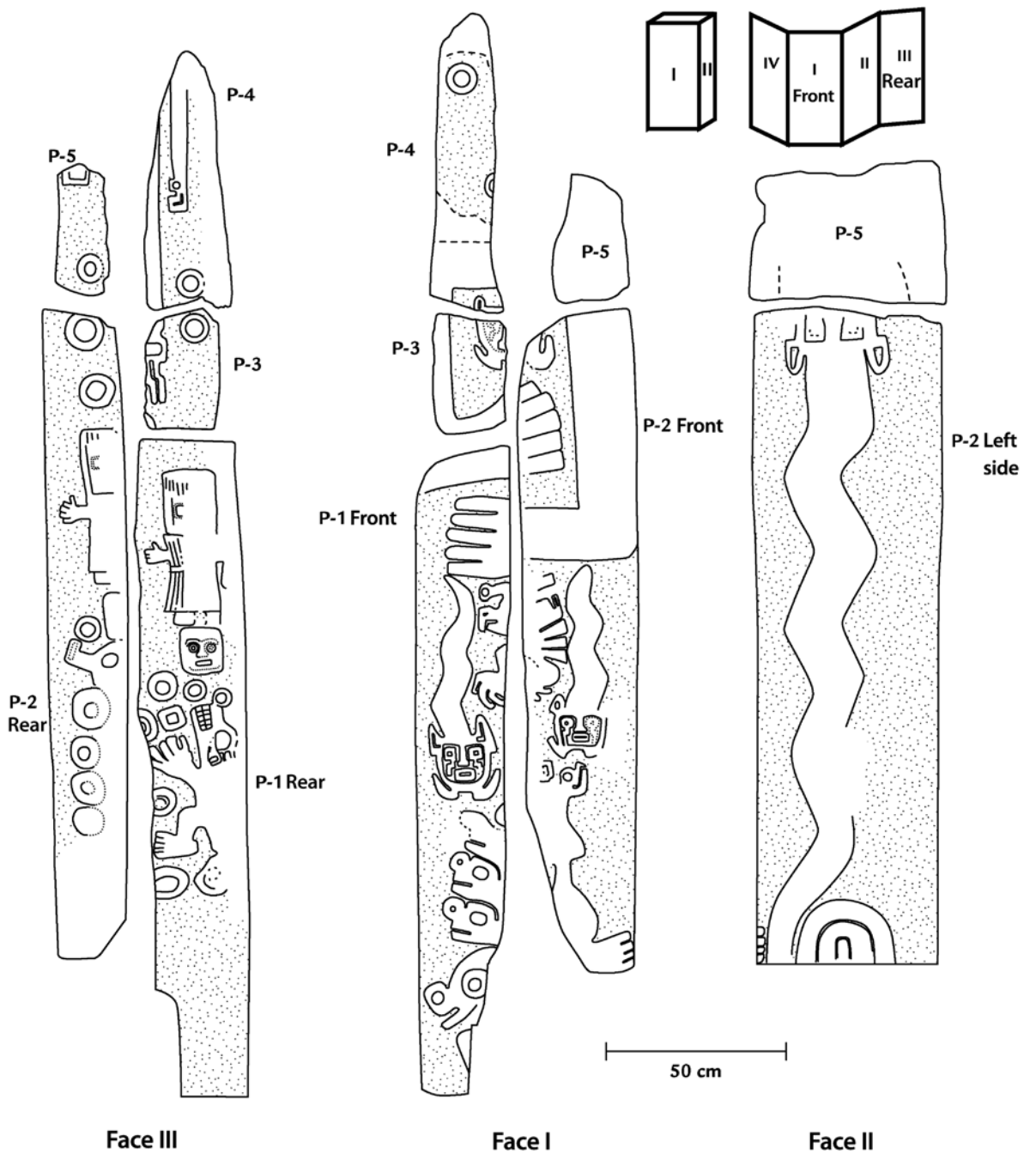

FIGURE 5.6 Reconstruction of the pieces of stela 4 (Portugal Stela). *Drawing by Arik Ohnstad.*

tional context it was discovered. Two large fragments were recovered and described, one of which (P1) was approximately 187 cm long and 53 cm at its widest point; the other (P2), about 183 cm by 33 cm. Portugal Zamora also seems to have found three smaller blocks (P3, P4, P5), although he does not mention these in the 1941 publication.

Portugal Zamora assumed that the stones were from the same stela, and this is reasonable. The three smaller blocks can plausibly be fit with P1 and P2 as shown in figure 5.6.[3] Refitted, the fragments reveal the crossed arms of an anthropomorphic being similar to that on stelae 1, 2, and 3; the arms, however, are crossed over the torso in the opposite configuration of stelae 1 and 3, that is, right above left. If this reconstruction is accurate, the stela would have measured about 300 by 62 by 53 cm, although it is uncertain how much might still be missing from the top or bottom of the monolith (fig. 5.7).

The presumptive face of the monolith (on P4, Face I) has a rounder eye than that of the Wila Kala and lacks the zigzag eye streamers of the latter. Below the central figure's crossed arms there is a figure that, due to its placement in the region of the navel, bears some resemblance to the "rayed head" motif (Chávez and Chávez 1975) seen on such Pajano/Yaya-Mama sculptures as the Taraco and Mocachi stelae (see fig. 5.8a). Flanking this figure and descending from the left arm of the central personage are two of the familiar Khonkho/Tiwanaku-style eared serpents. These are remarkable among the Khonkho monoliths in that the end of its tail is visible; the spiral tail of the longer serpent on the preserved lateral side of the stela (Face II) is also remarkable for the same reason, and since it seems to extend a southern basin tendency toward recurved tails (see discussion below).

Below the serpent on P1 is a figure with a number of large, hydralike feline heads, similar to the wings and tail of the cameloid creature on the Jinchun Kala, but they also broadly resemble the ramiform feline heads seen on the Yaya-Mama stela from Taraco as well as on Paracas and Nasca ceramics and textiles (see Chávez and Chávez 1975). However, these possible models are not

FIGURE 5.7 A large sandstone block at a quarry site in the mountains, about 12 km northwest of Khonkho. This stone, which seems to have cracked while being worked, measures 8.85 m in length. Had it been finished and erected as a stela, it would have been the largest of the Formative stelae in the Titicaca Basin.

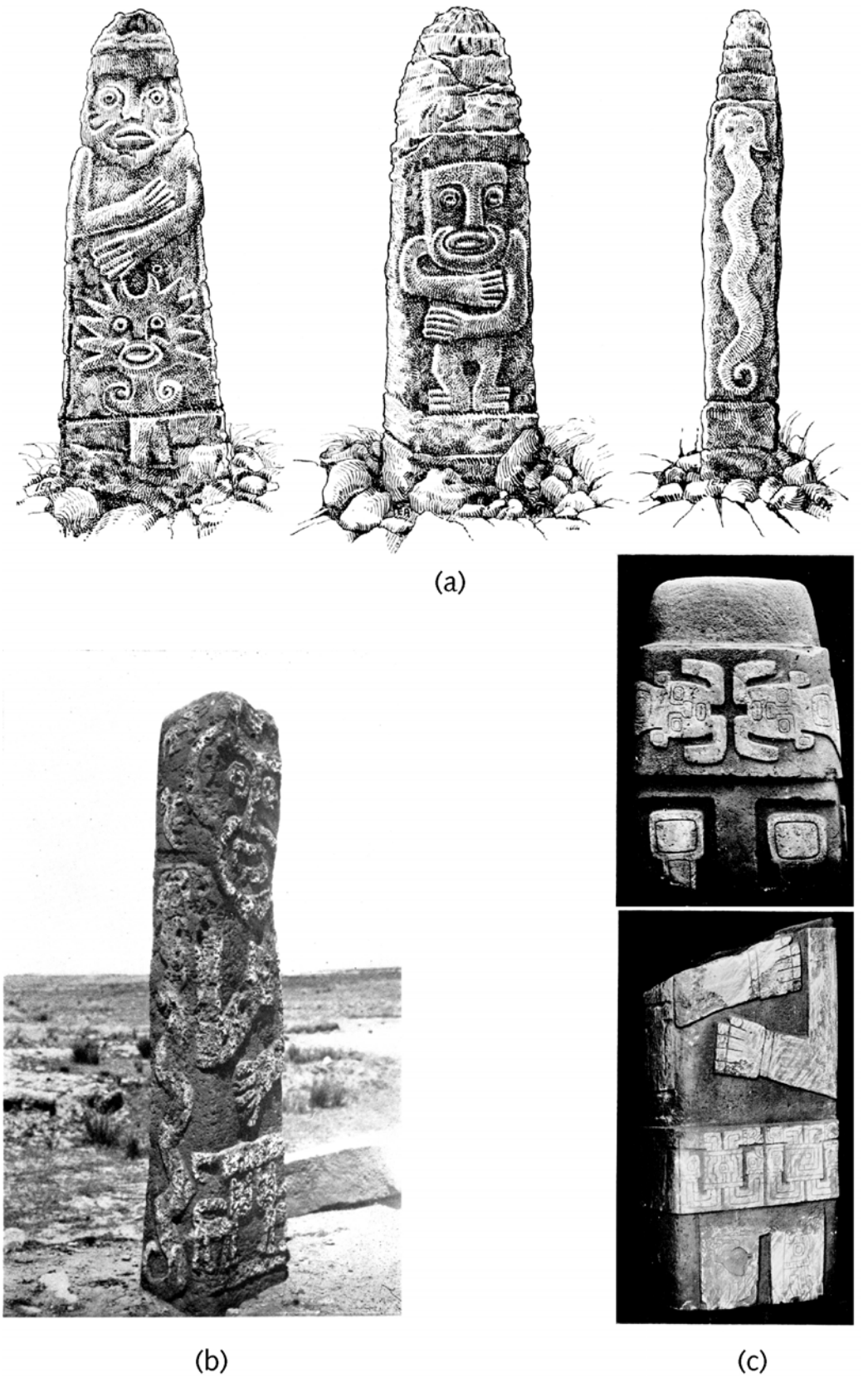

FIGURE 5.8 Three stelae with direct comparisons to Khonkho Wankane monoliths: (*a*) the Mocachi Stela (after Casanova 1942, fig. 3); (*b*) Tiwanaku stela 15 (the "Bearded Monolith") (after Posnansky 1945, figs. 87, 87a); (*c*) the "Ídolo Plano" from Tiwanaku (after Posnansky 1945, figs. 105, 106).

reflected across the fracture on P2, where we encounter a raptorial bird with an elongated neck (perhaps a fledgling), as well as a four-toed foot. The appearance of a predatory bird on stela 4 is unique among the Khonkho monoliths, and nearly so among Pajano/Yaya-Mama monoliths generally.[4]

Nearly all previous discussion of stela 4 has focused on what appears to have been the rear panel (Face III) of the monolith. On each stone (P1 and P2), a small humanoid figure wearing a pleated tunic or skirt is shown, standing atop a disembodied head (in frontal view). A number of low-relief rings, which may represent stars, blood, water, or "the origin of life" (Browman 1997a), are placed above and below. These are mostly concentrated around a bestial creature beneath the humanoid figure. On P1, this is an anthropomorphic creature with human limbs and a long, coiled tail, a feline (or possibly camelid) head, and a feline crouch. On P2, the figure below the disembodied head has a snout terminating in the upturned "*Orestias*" motif but is otherwise not preserved. Each of the lesser elements makes appearances in other Formative monuments of the Titicaca Basin. Similar rings, for example, are quite common on other Pajano/ Yaya-Mama monuments, although they are nearly always depicted as single, isolated elements (Browman 1972, 1997a). Disembodied heads can be found on a number of stone carvings, while smaller, frontally depicted figures can be found on others, such as the Mocachi stela (Casa - nova 1942, fig. 3).

The upper portion of the rear of the monolith may depict hair or a long headdress, roughly along the lines of that on the rear of the Jinchun Kala. In this case, however, different strands or tresses are of different lengths, and in addition to *Orestias*-headed streamers, there is also a streamer that has a wavy feather motif similar to the upward pointing motif on the uppermost lateral panels of the Jinchun Kala.

The combination of all these features makes stela 4 nearly unique among Titicaca Basin monoliths.[5] At the same time, stela 4 is stylistically recognizable as belonging to the Khonkho group, with the distinctive Khonkho depictions of whiskered serpents and feline heads in the rounded relief style. Stela 4 also has numerous connections with Pajano/Yaya-Mama stelae from other parts of the Titicaca Basin.

DISCUSSION

The descriptions above suggest that the stelae at Khonkho exhibit variances in form and style that can be attributed to temporal factors. We can, I argue, seriate the stone stelae from Khonkho according to a number of factors. First, there are a number of lines of evidence that suggest that stela 3, the Tata Kala, is the latest of Khonkho's stelae:

1. Stela 3 is carved from gray sandstone, while the other three monoliths are of a markedly red sandstone. More than fifteen gray sandstone monoliths and stela or architectural "blanks" (fig. 5.7) have been identified abandoned between Khonkho and quarry sites about 12 km away. Since these abandoned stones presumably represent the latest stone quarried for monumental construction at Khonkho, it is very likely that stela 3 is also relatively late.[6]

2. Stela 3 appears to be in its original position in Khonkho's central sunken plaza (fig. 5.1). It is located at the exact center of the plaza and has clearly "slumped" only relatively recently from a standing position to a prone one, a fact surmised not only from its inclined position but also from the fact that it is the only stela that is weathered on all four sides. Moreover, excavations in 2005, supervised by Maribel Pérez-Arias, appear to have located the wedge stones intended to hold the base in place (M. Pérez Arias 2006); Pérez also recovered small sheets of gold lamina from beneath the monolith's base.[7]

3. Browman's criteria of rectilinearity and "empanelment"—the degree to which the surface of the sculpture is divided into discrete panels—also suggest that stela 3 is the latest of Khonkho's carved monoliths (Browman 1972, 1997a; Ohnstad and Janusek 2010; Janusek and Ohnstad, in press). It is clearly empanelled, given the clear traces of both the headband and belt panels. Moreover, the rectilinear indentation of the head from the shoulders is characteristic of Classic Tiwanaku

sculpture rather than the Pajano style, which should place it later in date.

Browman's criteria also suggest that stela 4, the Portugal Stela, is the earliest of the Khonkho stelae. Stela 4 is not divided into separate, empanelled zones, and it is also not very rectilinear. In cross section, the corners are quite rounded. The closest thing to empanelment on stela 4 is the shoulder girdle, which it shares with all the other Khonkho monoliths.

Stelae 1 and 2 would fall between stelae 3 and 4 in this seriation, being empanelled (with six vertical zones each), but without the rectilinear offsetting of the head seen in stela 3. Again, this feature is shared with a number of stelae in the southeastern basin, including the Wakullani stela (Portugal Ortiz 1998, fig. 90), the decapitated stela from Tiwanaku discovered by Cordero Miranda (Portugal Ortiz 1998, fig. 85), and the more rectilinear stela known as the Ídolo Plano (fig. 5.8c). The latter two stelae share a version of the eared serpent that is very close to the Khonkho style; therefore, they are likely contemporary with or later than stela 3. (The Ídolo Plano, with its Formative composition but strong emphasis on rectilinearity and use of the symbols Posnansky [1945] called the "Sun" and "Moon" symbols, is stylistically and iconographically closer to classic Tiwanaku stelae, and likely marks the end point of this evolution.)

A number of features also link stela 4 to other monoliths in the southern basin, stelae that have generally been judged to be earlier (Browman 1972; Chávez and Chávez 1975; Portugal Ortíz 1998). Stela 4 has smaller, frontal, humanoid figures on reconstructed Face III. This, together with the single-headed, upward-facing serpent that decorates the side of the monolith (Face II), links stela 4 with monoliths from Mocachi (fig. 5.8a), Waka Kala, and Tiwanaku (stela 15, the "Bearded Monolith"; fig. 5.8b). All of these have legless primary figures with crossed arms, a low degree of empanelment (generally incipient, as in the belt panels of both the Mocachi stela and Tiwanaku stela 15), subsidiary frontally depicted humanoid figures on their rear panels, and single, upward-facing serpents with recurved or spiral tails on their side panels. While dates for most of these stelae are not certain, the sunken court architecture associated with the Waka Kala stela has been dated to Late Formative 1 by Bandy (2001, 178–79), a date that accords well with the Khonkho sequence.

Regionally, the Late Formative period extends from about 250/200 BC to about AD 500 (see review in Janusek 2004c). A series of sixteen radiocarbon dates from our excavations in Khonkho's Sunken Temple and later Dual Court Complex, along with the other areas of the ceremonial center (Janusek 2005; Janusek and Plaza Martínez 2006, 2007), suggests that the period in which the ceremonial center at Khonkho was in use stretched from about AD 120 to 540, based on one-sigma dates.[8] The radiocarbon dates that bracket this series are shown in table 5.1. Since the stelae are

Table 5.1. Selected radiocarbon dates from architectural features that bracket the construction sequence in Khonkho's monumental core

Lab No.	Sample No.	Uncalibrated Date	1-Sigma Range	2-Sigma Range	Context
AA74199	KW 19	1950 ± 33	AD 5–82	37 BC–AD 125	Surface beneath compound 1; predates Sunken Temple construction
AA66946	KW 1	1845 ± 44	AD 126–233	AD 68–316	Early floor of compound 1; likely predates Sunken Temple construction
AA66950	KW 5	1800 ± 52	AD 134–316	AD 84–377	Occupation surface above floor of Sunken Temple
AA66951	KW 6	1781 ± 66	AD 137–332	AD 85–400	Floor of Sunken Temple
AA66948	KW 3	1560 ± 37	AD 434–543	AD 417–579	Floor of southern court in Dual Court Complex

Note: Calibrations processed using Calib 5.0.1.

likely associated with the site's monumental zone, these dates should bracket the period during which the monoliths were erected at the site.

Given this baseline, we can associate stela 3 (Tata Kala) with its architectural context in Khonkho's central plaza. The central plaza was formed by the construction of the Dual Court Complex to the west and compound 3 to the east (see fig. 5.1 as well as Smith, chapter 3, and Marsh, chapter 4); radiocarbon dates from floors in both of these suggest a date between AD 300 and 550, toward the end of the radiocarbon sequence for Formative occupation at the site (see also Janusek and Ohnstad 2006). It is likely that stela 3 was raised after AD 400.

Stela 4 (the Portugal Stela), as Khonkho's earliest monolith, was likely carved toward the beginning of the site's monumental construction. If we follow the generally accepted idea that Titicaca Basin carved stelae are associated with sunken courts, we might naturally associate stela 4 with Khonkho's earliest sunken court structure, the Sunken Temple (see Smith, chapter 3). Indeed, there is evidence that both the Sunken Temple and stela 4 were deliberately destroyed in antiquity (Ohnstad, Smith, and Janusek 2006). Dates related to the Sunken Temple are given in table 5.1. The raw radiocarbon determinations show a high degree of overlap, but we can suggest a date of between AD 125 and 300 for the construction of the Sunken Temple and, by inference, the erection of stela 4.

Given their similarities in style and iconographic content, stelae 1 (Wila Kala) and 2 (Jinchun Kala) were likely carved contemporaneously. Falling as they do between the erection of stelae 4 and 3, they likely date between AD 150 and 500. Again, stela 3 falls at the end of the sequence, between AD 300 and 550. These dates compare well with radiocarbon dates recovered from Late Formative textiles (the "Pukara Provincial" group) that share some motifs with Khonkho statuary (see above), and which have been radiocarbon-dated to between c. AD 150 and 450 (Haeberli 2001; Young-Sánchez 2004; Blackmon, personal communication, 2007).

It is worth noting that, given that most chronologies place the end of the Classic Pukara ceramic style at AD 100–200 (see review in Klarich 2005), it is unlikely that the links between the Khonkho monoliths and Pukara ceramics described above are direct. Indeed, only a single sherd of Pukara-style ceramic material is known from Khonkho, and it was found in a level beneath the mound fill that underlies Khonkho's ceremonial zone (see Ohnstad 2007). Rather, it is more likely that the entire basin was engaged in the production and interchange of textiles similar to those of the Pukara Provincial style, which display many continuities with Pukara ceramic iconography (Haeberli 2001). It may have been predominantly through such textiles that different forms of imagery became salient for sculpture in the latter part of the Late Formative (Ohnstad and Janusek 2007).[9]

Monoliths from elsewhere in the southern region that share characteristics with the Khonkho stelae can also be related to this sequence as

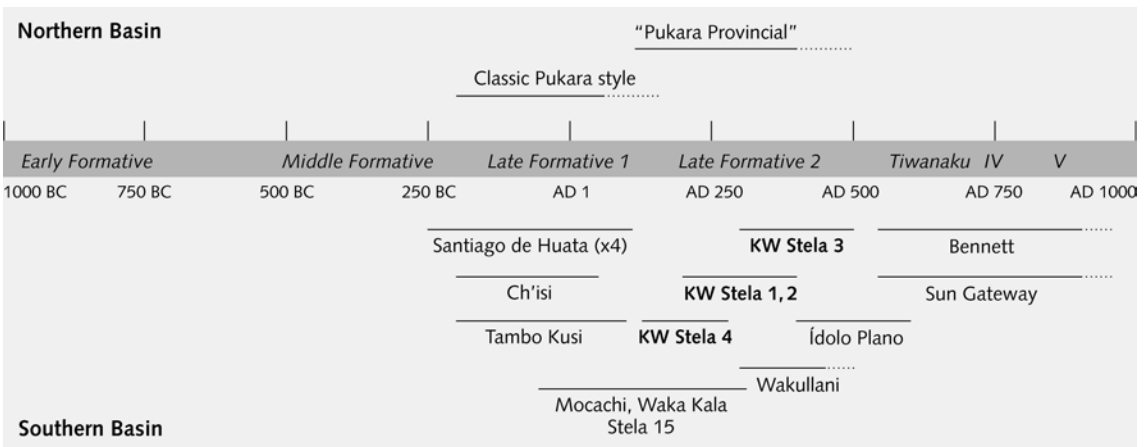

FIGURE 5.9 Estimated error bars for the carving dates of selected pieces of Titicaca Basin stone sculpture. Sources of data for the seriation include ceramic data from surveys and excavations, radiocarbon dates, and iconographic cross-dating. The stelae from Khonkho are shown in bold.

discussed above, including stelae from Tiwanaku, Mocachi, Waka Kala, Wakullani, and other sites. Figure 5.9 synthesizes the relationships suggested here, together with data from other sources,[10] to provide a chronologically anchored sequence for the erection of stone sculpture in the southern basin.

ACKNOWLEDGMENTS

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NOTES

1. An iconographically similar motif is also found on felines in Recuay ceramic styles (e.g., Buck 1937, fig. 61), on deer in at least one Tiwanaku period bowl, and in the mouths of condors on Tiwanaku period vessels, especially where they are associated with a gray puma (e.g., Posnansky 1945, 3, pls. 10b, 12b, 13b–c, 14a–b).
2. The recurved tails suggest the shape of a human ear, which possibly explains the name of this monolith.
3. It is by no means certain, however, that the stones are all from the same stela. For example, while the rear sides of P1 and P2 share very similar imagery, the images would be staggered in a highly unnatural way; compositionally, this kind of mismatch would probably be unique in all of pre-Columbian art. Moreover, there does not appear to be enough space available in the composition for either the left arm of the human - oid figure on stone P2 or for the creature with a "fish" face below it. For simplicity's sake, this chapter will consider stela 4 to represent a single carving, but it is certainly possible that there are pieces from two different stelae here.
4. A stone at Titimani also depicts a predatory bird, but it is not necessarily to be associated with the Pajano/ Yaya-Mama style (Portugal Ortiz 1998, fig. 44).
5. Sergio Chávez has published a rough sketch of a stela, apparently from Copacabana, Bolivia, that appears to share many of the elements of stela 4, including shoulder girdle, tailed serpents, multiple floating rings, disembodied heads, raptorial birds, and possibly a subsidiary frontal figure wearing a pleated skirt (Chávez 2004, fig. 3.1). It is hoped that a more complete documentation of this stela will someday be published.
6. Janusek (2006) has argued that the sequence of stone carving at Tiwanaku is similarly marked by a shift from red to gray stone (in this case, red sandstone to gray andesite).
7. The deposition of gold leaf immediately beneath monolithic statuary may have been a widespread Formative period practice. Gold leaf was recorded in 1621 by Padre Joseph de Arriaga beneath "altar" stones flanking a Formative period monolith at Wilaqollu on the Rio Ilave, Peru (Rowe and Donahue 1975, 36), and villagers at Tambo Kusi told me that they had found bits of gold when they excavated the monolith from the site of Corralpata (see Paz 2000).
8. Two-sigma dates: AD 70 to 580.
9. Strong iconographic ties also exist between the Pukara Provincial textiles and stone sculpture from the northern basin. These monoliths are generally strongly rectilinear and surrounded by a thin, carved frame; examples include various pieces from the Chumbivilcas region and the site of Pukara and from Qaluyu, Challapata, and other sites. I have suggested elsewhere (Ohnstad and Janusek 2007) that sculpture in this style represents a northern Titicaca Basin tradition that postdates Classic Pukara and is roughly contemporaneous with Khonkho and other Late Formative southern basin developments.
10. For example, the Waka Kala stela has been associated with Late Formative 1 ceremonial architecture (Bandy 2001, 178–79), while Tiwanaku stela 15 (fig. 5.8b) is now generally argued to be Late Formative 1 in date (Chávez 2004; Janusek 2006), especially in light of the lack of earlier Middle Formative materials found in a recent intensive survey of Tiwanaku (Lémuz Aguirre and Bandy 2004).

Chapter 6

Pukara de Khonkho: Preliminary Analysis of a Pacajes Hilltop Settlement

Jennifer M. Zovar

While many researchers have focused on the rise, consolidation, and collapse of Tiwanaku, post–Middle Horizon periods have been largely under-theorized and under-researched, especially in the southern Titicaca Basin. A recent growth in interest in the Late Intermediate period (AD 1150–1450), however, is leading to a more nuanced understanding that recognizes local and regional variation (for example, Arkush 2005a, 2008; Frye 1997; Frye and de la Vega 2005). Investigations conducted under the auspices of the Proyecto Jach'a Machaca have contributed to this growing body of research through the archaeological mapping and excavation of the site of Pukara de Khonkho, a hilltop settlement at the edge of Bolivia's Rio Desaguadero valley.

This chapter presents the results of three field seasons (2005–7) of mapping, excavation, and preliminary analysis. The research suggests that Pukara de Khonkho was in many ways distinct from typical Late Intermediate Colla and Lupaqa *pukaras* (fortified hilltop settlements) and that the settlement also stands out from nearby coeval sites in the Pacajes region. I begin the paper with a brief summary of current understandings of Late Intermediate hilltop settlements in the Titicaca Basin, in order to situate the results from Pukara de Khonkho in a regional context. I then describe the site, research methodology, and excavation results, concluding with a discussion of the possible implications of this new data.

Cultural Context: Colla, Lupaqa, and Pacajes Hilltop Settlements

Politically, the Late Intermediate period in the Titicaca Basin was characterized by the development of Aymara *señorios*. While often referred to as "kingdoms," these groups, which included the Colla (northwest of the lake), Lupaqa (to the southwest), and Pacajes (to the southeast), were probably made up of noncentralized competing peer polities (fig. 6.1). Data from the better-known Colla and Lupaqa areas form the bulk of our knowledge about the Late Intermediate period in the Titicaca Basin (see, for example, Arkush 2005a, 2008; Frye 1997; Frye and de la Vega 2005; Stanish 2003; Stanish et al. 1997). Nevertheless, it is not clear to what extent the Late Intermediate experience in these regions is also representative of the experience southeast of the lake, in the former Tiwanaku heartland. Very few studies have focused on the Pacajes, and ongoing research at Pukara de Khonkho helps to fill this lacuna and leads to a better understanding of regional variation.

In the Colla and Lupaqa regions, pukaras are generally associated with chronic patterns of internecine and interregional conflict (Arkush 2005a; Arkush and Stanish 2005; Frye 1997; Stanish 2003). The defensive nature of these sites is suggested not only by their hilltop location but also by thick defensive walls, sometimes with parapets and lookout towers, along with caches of slingstones and other weapons. Analysis of settlement patterns suggests that the Colla and Lupaqa

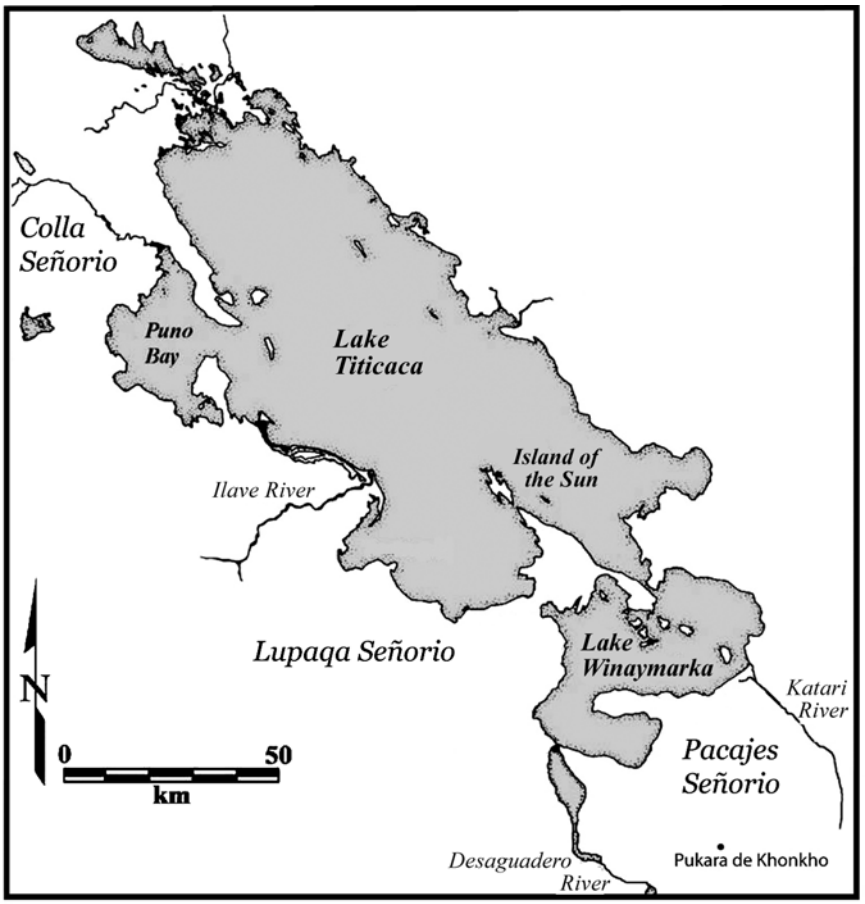


FIGURE 6.1 A map of Lake Titicaca showing the location of the Aymara señorios (*adapted from Janusek 2004b*).

were organized around semiautonomous polities that were often in conflict (Arkush 2005a; Frye 1997; Frye and de la Vega 2005). Most Colla pukaras and the larger Lupaqa ones date to the later part of the Late Intermediate period, implying an increase in conflict over time (Arkush 2005a, 285; Stanish 2003, 210).

While less research has been done in the Pacajes region, evidence to date suggests a slightly different pattern in the former Tiwanaku heartland. Following Tiwanaku collapse (c. AD 1150), population dispersed such that while there are more sites in the Late Intermediate period, they are so much smaller and more ephemeral that overall population estimates are much lower (Albarracín-Jordán and Mathews 1990; Bandy 2001; Janusek 2004a; Janusek and Kolata 2003). There are few recorded Pacajes pukaras, and Arkush (2005a, 169) has suggested that the experience of conflict may have been less in this area.

Although it is possible that a lack of pukaras may reflect a lack of research, few pukaras are noted even in intensively surveyed areas. Systematic survey of the lower and middle Tiwanaku valley by Albarracín-Jordán and Mathews (1990, 142–46; Albarracín-Jordán 1992, 279–81; Mathews 1992, 190) recorded only four hilltop settlements: Cerro Pakollu, Cerro Chullpa, Cerro Pukara, and an unnamed site. Bandy (2001, 233–35) reported an additional site, Cerro Pulpera, on the edge of the Taraco Peninsula. There are also reports of two or three similar pukaras in the hills bordering the Katari valley to the north (Graffam 1990; Janusek and Kolata 2003, 155; Janusek 2004a, 199; 2004b, 261–64). Finally, Pärssinen (2005, 102–20) records a large hilltop settlement called Pukarpata in the Rio Desaguadero valley, near Caquiaviri, which is distinct because of its large size and the presence of numerous circular structures as well as a few rectangular ones.

With the exception of Pukarpata, the Pacajes hilltop settlements that have been recorded are all small (between 1–6 ha), with little or no standing architecture except for defensive walls, and are generally interpreted as refuges without permanent habitation (Mathews 1992, 195). Most other

recorded Pacajes sites in the three valleys are small and ephemeral, suggesting a subsistence pattern based around nomadic pastoralism (Albarracín-Jordán and Mathews 1990; Albarracín-Jordán 1992; Bandy 2001; Janusek 2004a; Janusek and Kolata 2003; Mathews 1992). Pukara de Khonkho is a very different type of settlement. Its lack of defensive walls and signs of dense domestic habitation suggest that it may have served a different purpose than other pukaras in the region.

PUKARA DE KHONKHO: NATURAL AND BUILT ENVIRONMENT

Pukara de Khonkho is located in the foothills of the Quimsachata mountains at the northern edge of the Rio Desaguadero valley, about 25 km south of Tiwanaku and approximately 4 km north of Khonkho Wankane (fig. 6.2). The site stretches across the south face of a steep rocky slope, encompassing two peaks, locally described as the Jach'a Pukara (4293 m.a.s.l.) and the Jisk'a Pukara (4182 m.a.s.l.). The northern side of the Jach'a Pukara drops off rapidly with a series of rock faces, which also bound the site to the east and west. The landscape is naturally rocky, and bedrock is close to the surface, with outcrops in various locations across the site. Pukara de Khonkho offers a commanding view of the altiplano to the south, overlooking several modern villages and the site of Khonkho Wankane.

Pukara de Khonkho is also visible from the altiplano due to the six long terraces that stretch across the site from east to west (fig. 6.3). While some scattered structures are found below the lowest terrace, the terraces clearly delimit a community space that is distinct from the surrounding landscape. The settlement covers more than 20 ha and contains over five hundred circular structures and numerous small retaining walls, making it easily larger than any other Late Intermediate site recorded in the Pacajes region except for Pukarpata. Moving east to west, structures are roughly grouped into four areas, separated by major bedrock outcrops, but houses and artifacts are similar all across the site (fig. 6.4).

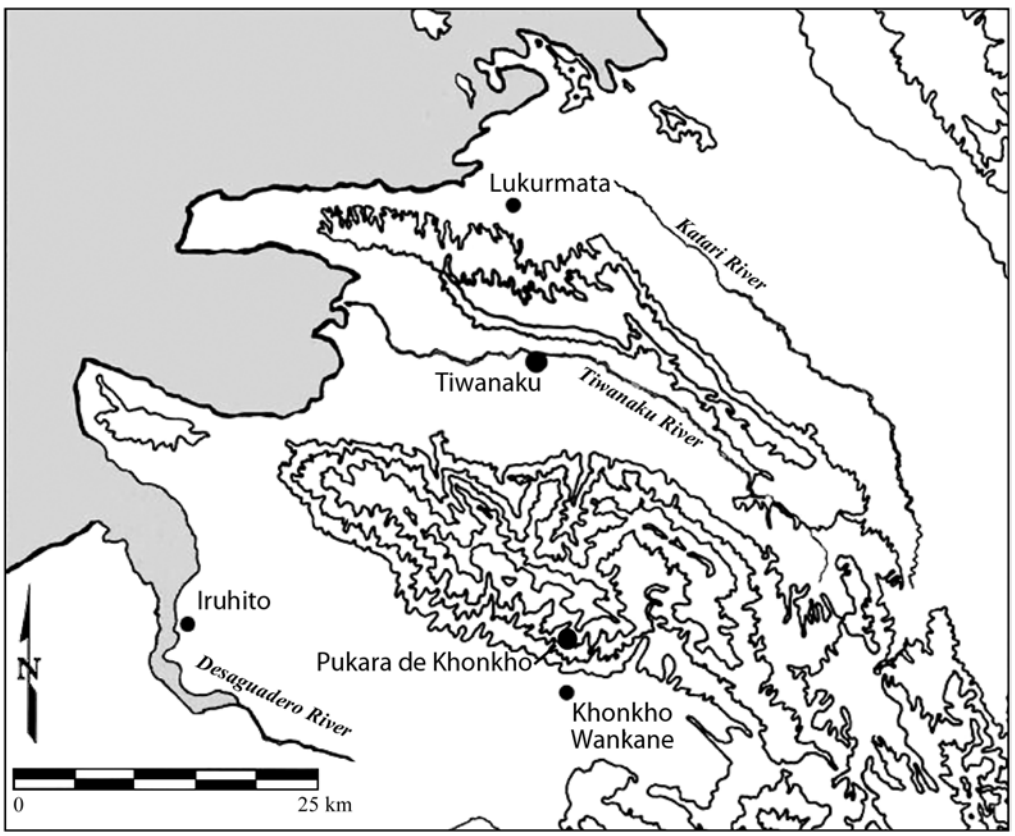


FIGURE 6.2 The location of Pukara de Khonkho.

FIGURE 6.3 The main face of Pukara de Khonkho. Terraces are visible on the hillside.

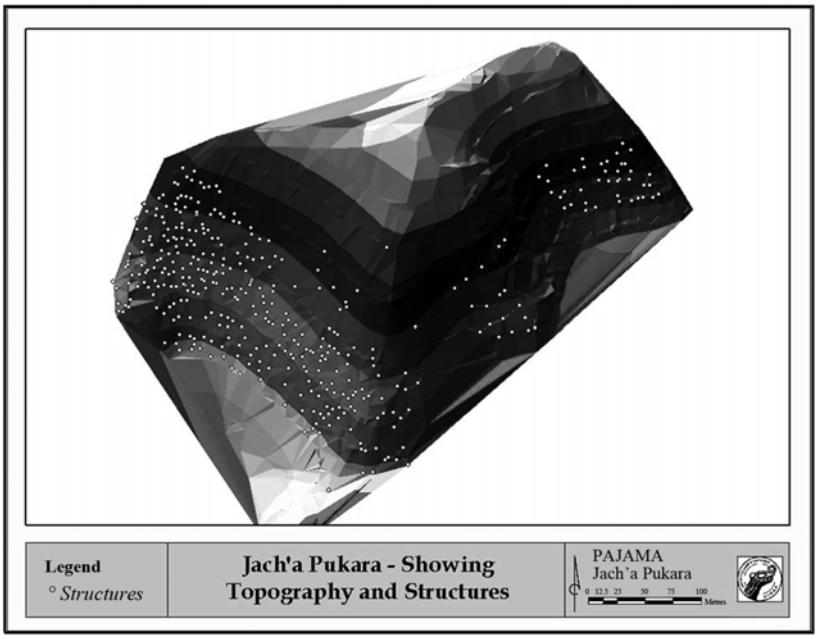


FIGURE 6.4 A map of the main and eastern faces of Pukara de Khonkho, showing the location of circular structures. *Map prepared by Scott Smith.*

The majority of the structures are found on the fourth terrace, but habitation is also dense on the third and fifth terraces. There are only a few structures on the second terrace and nothing visible above the surface on the highest terrace. The lowest (sixth) terrace wraps around the Jisk'a

Pukara and another prominent outcrop, which together frame the main face of Pukara de Khonkho. Interestingly, these outcrops appear to mark separate cemetery areas, integrating the natural and constructed landscape.

All structures at Pukara de Khonkho are roughly the same size, with internal diameters between 1.25 and 4 m, averaging around 2.44 m. Structures follow one of two distinct patterns of construction. In the first type, large flat stones stand upright, representing the stone foundations of adobe walls (fig. 6.5). The second type is more finely made, with the same kinds of stones carefully stacked flat on their sides to form a stone wall (fig. 6.6). Doorways are usually found in the east or west, and niches often appear in the north wall of the second type of structure. The structures are all in close proximity to each other, and there is little internal differentiation or sign of social hierarchy. Like most Late Intermediate settlements across the basin, there is no public architecture or other obvious center for government or religious authority. However, some degree of community organization would have been necessary to build the long domestic terraces, which include constructed doorways providing access between the terrace levels.

Typologies developed for Colla and Lupaqa pukaras do not seem to adequately characterize Pukara de Khonkho. In the Lupaqa area, Stanish (2003, 209–10; Stanish et al. 1997) differentiates between major pukaras, minor inhabited pukaras, and minor refuge pukaras, while Arkush (2005a, 250–56) establishes six categories of Colla pukaras, ranging from "unoccupied refuges" to "very large pukaras." Based purely on its size and number of residential structures, Pukara de Khonkho should be characterized as a "major pukara," using Stanish's Lupaqa typology, or as a "large pukara," using Arkush's Colla typology. However, Pukara de Khonkho lacks some of the other major correlates of these types of sites. Primarily, large pukaras should have major defensive walls, while Pukara de Khonkho has only residential terraces. Additionally, there are no weapons caches or walled streets. Furthermore, Pukara de Khonkho has no parapets, which are commonly found at Colla large pukaras (Arkush 2005a, 271–72).

Pukara de Khonkho is a single-component site, with all ceramics stylistically dating to the Late Intermediate period. There is no evidence for prior (Tiwanaku period or earlier) use of the hillside, and the site appears to have been abandoned around the time of Inca conquest. Radiocarbon dates collected from two burials and the occupation levels of eight circular structures suggest that the site was initially occupied in the mid-fourteenth century, with the most intense occupation at the very end of the Late Intermediate period, between AD 1400 and 1450. While this seems

FIGURE 6.5 In the first type of structure, upright stones provided the foundation for adobe walls.

FIGURE 6.6 In the second type of structure, stones were stacked to form a stone wall.

in line with data from other regions that suggest pukaras were a late development (for example, Arkush 2008, 350), other features of site organization suggest important regional differences.

RESEARCH BACKGROUND AND METHODOLOGY

Pukara de Khonkho was first recorded in 1938 by the Swedish archaeologist Stig Rydén, who excavated two circular structures (Rydén 1947), but the site received no further archaeological attention until the Proyecto Jach'a Machaca began investigations in 2005. From the beginning, Proyecto Jach'a Machaca's research at the site focused on issues surrounding community formation and development in a post-collapse society. Initially it was hypothesized that the inhabitants of Pukara de Khonkho had moved up from the site of Khonkho Wankane, probably for reasons of defense in the climate of sociopolitical instability that followed Tiwanaku collapse. However, as research progressed, significant differences in settlement organization and in ceramic forms and designs were noted between the site of Pukara de Khonkho and surrounding Pacajes settlements. This raised the possibility that the inhabitants of Pukara de Khonkho may have been migrants from another region or that site differences were due to temporal changes over the course of the Late Intermediate period. Research questions expanded to address issues of migration and the role of external relationships (warfare, trade, etc.) in the formation of community identity over time.

In order to clarify site boundaries and organization, the first step was to complete a map of the site including all above-ground construction (circular structures, terraces, and small retaining walls). Mapping was conducted with a TopCon Total Station and plotted in ArcGIS. Excavation focused on the circular structures, which were hypothesized to represent domestic habitation. In order to identify possible variation within the site, a stratified random sample of eighteen structures, representing different construction types, sizes, and terraces, was chosen for excavation. Both the

inside and areas directly outside the structures were excavated down to sterile soil or bedrock, when possible. In addition, three test units were opened on the empty upper terrace, and burials were excavated from separate cemetery areas on terrace 6. While in-depth analysis of ceramics and other artifacts was ongoing as this chapter was written, it is possible to use the available evidence to address issues of community formation, migration, and intercommunity interaction in the post-collapse Titicaca Basin, adding data from the Pacajes region to our knowledge of the Late Intermediate period.

EXCAVATION RESULTS

Eighteen structures were excavated between 2005 and 2007, representing both structures with stacked stone walls and those that placed the stones on end as foundations for adobe brick walls. Excavated structures included one from terrace 2, three from terrace 3, six from terrace 4, two from terrace 5, four from terrace 6, and two from below the major terraces.

Surprisingly, given their architectural similarities, there was significant diversity in the quantity and types of artifacts found in and around each structure, and it seems that different structures may have been used for different functions or by different groups of people. Larger-than-average stone-walled structures on terraces 2 and 3 with good views of the altiplano and of the rest of the site contained almost no ceramic artifacts, although they did contain a few metal tools or adornments. Their relative emptiness suggests that they did not serve as regular domestic habitations, although they could have been used for ritual purposes or as defensive watchtowers. Other, more numerous, stone-walled structures located on lower terraces, however, had more domestic-looking assemblages, including jars, ollas, and painted bowls as well as camelid, small mammal, and fish bones. Metal tools or adornments were found in most but not all of these structures. Some structures also contained specialized stone and bone tools, including possible musical instruments, both within the structures and in possible outdoor workspaces. In contrast, the other type of structure, which used upright stone foundations, may represent separate cooking or storage facilities, as these structures held a larger quantity of storage jars and cooking ollas and only a small percentage of decorated ceramics or other artifacts.

Preliminary ceramic analysis suggests that the ceramics from Pukara de Khonkho are distinct from ceramics from the more typical small ephemeral Late Intermediate occupations on the altiplano below. An initial analysis focused on samples from the occupation layer of ten of the eighteen excavated structures. Like other Pacajes ceramics, those found at Pukara de Khonkho are primarily utilitarian. There are few finewares, no polychromes, and usually bowls are the only decorated forms, although some small jars are painted as well (compare with Albarracín-Jordán 1992, 1996a; Bandy 2001; Janusek 2003b; Mathews 1992). Nevertheless, Pukara de Khonkho also has certain forms and designs that are unique from surrounding settlements. To give one example, Mathews (1992, 187) identifies the "disk base" as characteristic of Early Pacajes wares, but this form is extremely rare at Pukara de Khonkho (fig. 6.7). Additional ceramic analysis is still necessary to clarify the range of differences between Pukara de Khonkho and other sites.

In addition to excavating structures, three test units were opened on the highest terrace, where no structures were present, in order to test for subsurface structures or features. No artifacts were recovered from any of these units, clearly demonstrating that the peak of Pukara de Khonkho was not used for domestic purposes. While it is difficult to infer use patterns from negative evidence, it is possible that the area may instead have served to pasture camelids or for a more ritual purpose. Since ceramic sherds are found in such large quantities across the rest of the site, the almost unnatural cleanliness suggests that the higher areas may have been special or set apart from everyday life, an interpretation that is further supported by the relative emptiness of the large structures located on the second terrace and parts of the third terrace.

While the lower terraces are characterized by dense domestic habitation, investigations also identified probable cemetery areas on the lowest terrace located near two large outcrops that flank

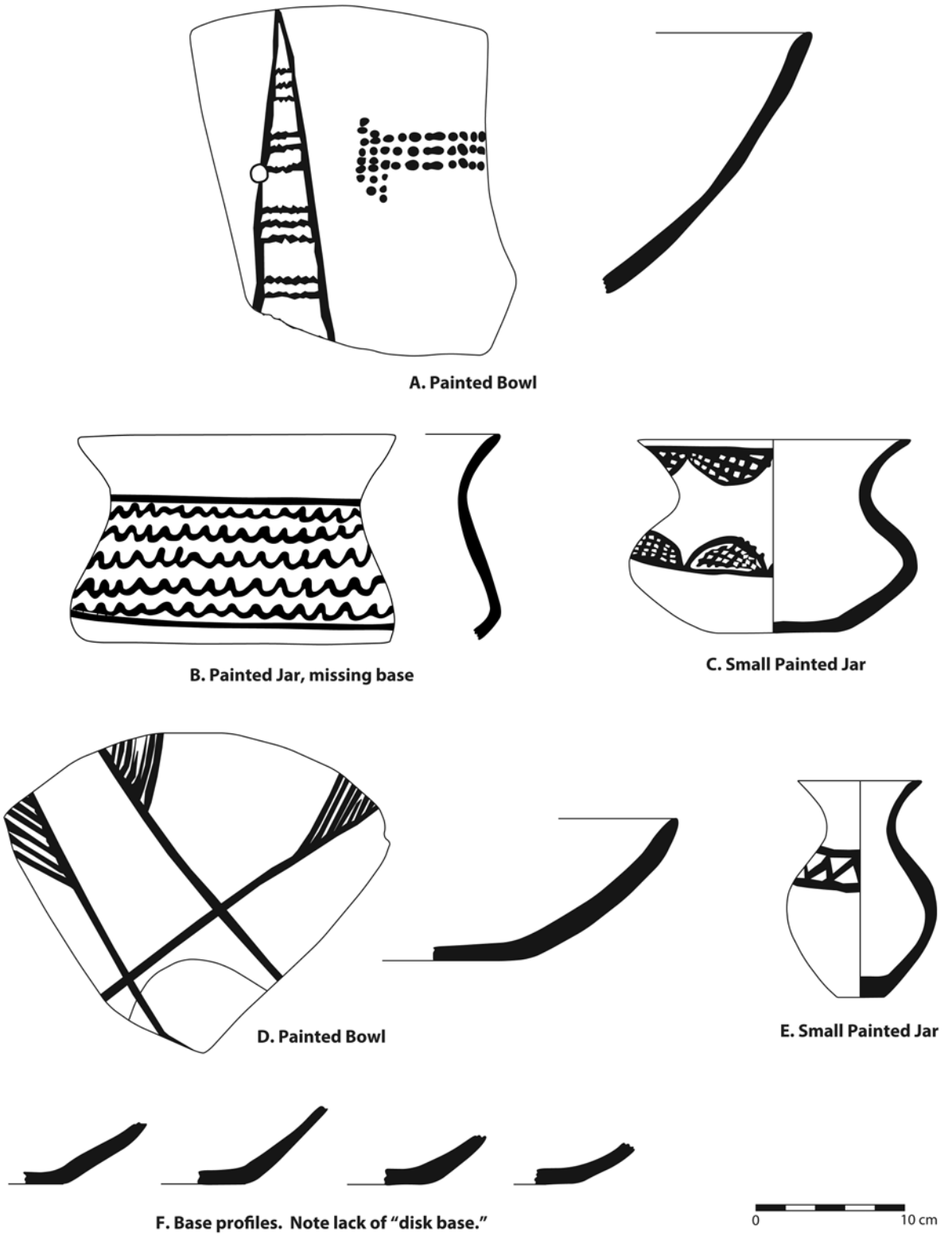


FIGURE 6.7 Ceramics from Pukara de Khonkho. *Illustrations prepared by the author.*

FIGURE 6.8 Burials were found under this outcrop at Pukara de Khonkho.

the main face of Pukara de Khonkho. The four burials (containing a total of five individuals) do not fit well into the regional pattern of burials, as there is no obvious above-ground component (see de la Vega, Frye, and Tung 2005; Hyslop 1977; Stanish 2003). Instead, the burials are dug partially into the bedrock beneath large outcrops (fig. 6.8). All burials exhibited cranial modification when cranial elements were present (n = 4), and only one contained burial goods of any kind.

Burials were noted in two locations on Pukara de Khonkho itself. Three burials—an older female, a young adult male, and an infant—were found in very close proximity (within the same 2 by 2 m unit) under an outcrop west of the site's main face. All burials faced toward the east and were lined by two upright stones, which in some cases were partially visible on the eroded surface. Only the infant had any burial goods, consisting of a single metal bead near the child's left eye. An additional burial was found under the outcrop that tops the Jisk'a Pukara, to the east of the main face, but this burial was quite different, although still dug into the bedrock and lined by two small stones. The bones were scattered throughout the burial cut, and only small sections were still articulated. In addition, some bones were heavily burned, and the bones of at least two individuals were present. However, only one pelvis and one cranium were included, making it difficult to determine sex and age for both individuals. The pelvis is clearly that of an older female, but the skull may belong to a younger individual. Interestingly, a second unit opened just to the west of this burial uncovered a single circular cist tomb capped with a large rock that had been previously used as a grinding stone. The stone covered a partially stone-lined cist 90 cm deep, which was not found to contain any bones or cultural materials. While it is possible that the tomb may have originally held one or both of the individuals excavated from the secondary burial just 2 m away, it is not clear when or why the individuals would have been moved.

In addition, heavy erosion exposed a single burial beneath an outcrop on a hill just southeast

of the site. The individual was an older adult male with at least three major dental abscesses and a healed break at the right knee. Although well outside the site boundaries, it is interesting that the burial was located near a circular structure similar to those at Pukara de Khonkho and that it followed the same sort of pattern, facing east in a burial cut into the bedrock and lined by two stones beneath an outcrop. After this pattern had been identified, a number of other possible burial locations were noted on Pukara de Khonkho itself but were not excavated.

DISCUSSION

Taken together, the settlement organization, ceramic artifacts, and burial patterns at Pukara de Khonkho are all distinct from nearby Late Intermediate sites and from other pukaras in the Titicaca Basin. The site is larger and was more densely populated than anything else in the region, but despite its defensive location, it is not fortified by defensive walls or lookout towers. In addition, certain elements of the ceramic style are unique to the area, as is the burial pattern, which uses natural outcrops to mark burial locations, rather than constructed *chullpas* or slab cist tombs. While additional research is necessary, the idiosyncratic nature of the site suggests the possibility that the inhabitants of Pukara de Khonkho may have been migrants to the area or that the site may be temporally distinct from other recorded Pacajes settlements. In either case, it appears that Pukara de Khonkho may have played a slightly different role than other pukaras in the Titicaca Basin.

In contrast to population drops in the Tiwanaku valley and on the Taraco Peninsula (Bandy 2001; Mathews 1992), Janusek (2004a, 2004b) and Pärssinen (2005) have found evidence of actual population growth in the drier areas farther south near the sites of Pukara de Khonkho and Caquiaviri. They posit that populations may have moved into the region to take advantage of its suitability for pastoralism as Tiwanaku-sponsored agricultural production began to decline. The archaeological evidence is also supported by ethnohistoric records (Paredes 1955). Mercado de Peñalosa ([1583] 1965, 337–38) records that some Pacajes claimed to have emigrated from the "Laguna de Chuquito" (Lake Titicaca), while others said they came from the Carangas region, to the south.

Archaeologically, Goldstein (2000, 2005) argues that diasporic communities are generally located in peripheral regions, that they demonstrate distinct ethnic identities from other nearby communities, and that they maintain an affiliation of identity with their homeland, partially through a structural reproduction of the homeland hierarchy within the site. Owen (2005) identifies possible post-Tiwanaku diaspora communities in the Osmore drainage of Peru on the grounds that they are located in defensive, previously unoccupied areas and have distinct material culture from the surrounding communities. This description also characterizes the site of Pukara de Khonkho, which is surrounded by other Late Intermediate period settlements that are different in both settlement structure and material culture.

However, it is also possible that differences between the site of Pukara de Khonkho and the small, ephemeral altiplano sites and small refuge pukaras that were previously known in the Pacajes area may be due to chronology. As previously noted, Pukara de Khonkho dates to the very end of the Late Intermediate period, while the few Pacajes sites that have been radiocarbon dated returned dates that are much earlier (see Albarracín-Jordán 1996a, 273; Janusek 2003b, 39; Janusek and Kolata 2003, 155). Further research across the region is needed to see if it is possible to articulate two different Late Intermediate period phases in the southern basin much as Arkush (2008) has done in the north.

It does appear that Pukara de Khonkho may have served a different function than many of these northern pukaras, however. The site is in an extremely defensive location but lacks other correlates that suggest endemic warfare. It is densely populated with small, primarily domestic, structures and has a complete lack of specialized ceremonial or political architecture. The only walls are domestic terraces rather than fortifications, and excavation has only uncovered a few possible weapons, which could also be explained as tools for herding or agriculture. Furthermore, there are

few pukaras in the region, suggesting less intense patterns of warfare than in the Colla and Lupaqa areas.

Nevertheless, while conflict does not seem to be as primary a concern at Pukara de Khonkho or in the Pacajes region as in the Colla and Lupaqa regions, this does not mean that we should downplay the defensive potential of the site or the military capabilities of the Pacajes population. Pukara de Khonkho is naturally defensive, with many approaches blocked by rock faces. Rydén (1947, 327) even suggests that the terraces may serve better as defensive platforms than would walls with parapets, which can interfere with the effective use of a sling (the primary weapon during the Late Intermediate period). Furthermore, the 1583 *visita* of Mercado de Peñalosa ([1583] 1965, 338) stresses the warlike nature of the Pacajes population and gives a detailed description of fighting techniques. Rowe (1946, 207–8) also points out that, according to colonial documents, the Pacajes united with the Lupaqa to rebel against the Inca. Even if Pukara de Khonkho was not initially intended as a fortress, its natural defenses could still have been utilized in times of conflict, and local community members relate that the site was used as a defensive base during a local indigenous revolt in 1921. However, while its defensiveness may well have been one important characteristic of the site, it is useful to consider other possible modes of interaction, including intercommunity trade.

The collapse of Tiwanaku was also a collapse of long-distance trade networks, when many of the settlements that had previously acted as "middlemen" for the Tiwanaku trade developed into regionally independent axis settlements in their own right (Dillehay and Núñez Atencio 1988). As regional chiefdoms began to form, shorter trade routes and growing numbers of fortresses suggest an increase in conflict. However, it is important not to assume that increased conflict implies diminished trade, as conflict is actually cross-culturally often associated with trade and population movement (Keeley 1996). Topic and Topic (1987), using examples from Peru's North Coast, note that fortifications were often associated with major roads and trade ceramics, suggesting that they were not only defenses against attack but also control points regulating interaction and trade between various groups.

The idea that trade could have been important in the development of the site is bolstered by the fact that Pukara de Khonkho sits near a sort of border region between the resource-rich Tiwanaku Basin and the drier altiplano to the south, which is much better suited to pastoralism. Such a position would make it well situated as a trading center. In the sixteenth century the Rio Desaguadero was a route for regional movement and trade (see Choque Canqui 2003), and this could have been the case in earlier times as well.

CONCLUSION

Preliminary results of the archaeological investigations at Pukara de Khonkho indicate that the site can provide significant insight into regional expressions of variability during the Late Intermediate period in the Titicaca Basin. While somewhat distinct from the large, fortified hilltop settlements north and west of the lake, the large size, dense habitation, and easy visibility of Pukara de Khonkho suggest that it had a level of regional importance. The site is in a defensible location, and in spite of a lack of fortifications, would have been fairly easy to protect during times of conflict. Nevertheless, it is unlikely that defense was the primary purpose for the settlement of such a large site, and it is also possible that Pukara de Khonkho could have been important in regional trade. In addition, the site's distinctive settlement organization, ceramic styles, and mortuary pattern, together with its location in a previously uninhabited area, suggest that the inhabitants could have been recent immigrants to the Rio Desaguadero valley. Another possibility is that these differences may simply reflect local chronological changes within the Late Intermediate period. Continuing analysis will both contribute to our knowledge of a poorly understood period in the southern Titicaca Basin and add to a more general understanding of community-level organization in post-collapse societies.

ACKNOWLEDGMENTS

Thank you to the many people who have contributed to this research, especially Anna Harkey, Di Hu, Scott Smith, Luis Viviani, and Joel Zovar, who all assisted with mapping and excavation at Pukara de Khonkho, and to Dr. John Janusek, who directs the Proyecto Jach'a Machaca and has been continually supportive of my investigations. Thanks also to the community of Qhunqhu Liqiliqi, especially Damaso Murillo, Angelino Queso, and Remberto Queso, who own the land on Pukara de Khonkho and whose assistance was invaluable. Research was funded by the National Science Foundation (BCS-0514624), the Curtiss T. and Mary G. Brennan Foundation, a Vanderbilt University Discovery Grant, the Howard Heinz Foundation, the National Geographic Society (7700-04), the Vanderbilt University College of Arts and Sciences Summer Research Awards, Sigma Xi Grants-in-Aid of Research, and a Wenner-Gren Dissertation Fieldwork Grant.

This chapter was written well before it was published, and updates to the research can be found in the author's dissertation (Zovar 2012).

Chapter 7

Demographic Dimensions of Tiwanaku Urbanism

Matthew Bandy

The nature of Tiwanaku urbanism has been one of the enduring questions confronted by archaeologists concerned with understanding the Middle Horizon. This question has been debated since the very earliest scientific writings on Tiwanaku (Bennett 1934; Ponce Sanginés 1981), and it continues to be debated today (Albarracín-Jordán 1996a, 1996b; Kolata 1993a; Janusek 2004b). The Cotsen Institute seminar that resulted in this volume provided an opportunity to assess the general conception of Tiwanaku urbanism among contemporary students of Tiwanaku culture. At one point in the seminar, the organizers (Stanish and Vranich) asked participants to provide their estimates of the population of both the urban core of Tiwanaku and of its Tiwanaku valley hinterland. I present the results of this survey here in order to identify consistencies in the perception of Tiwanaku urbanism among specialists. I will argue that even regional specialists fundamentally misunderstand crucial aspects of Tiwanaku urban and rural population, and that these misconceptions must be corrected if we are to arrive at an adequate understanding of the formation and nature of the city and polity of Tiwanaku.

A Consensus View of the Tiwanaku Regional Demography

The results of the seminar survey are presented in aggregate form in figure 7.1. The estimates of the urban population (fig. 7.1a) span an order of magnitude from 3,000 to 40,000, with a mean of 12,300 and a median of 7,700. Half of the survey respondents, in other words, believed that the urban population of Tiwanaku was less than 7,700 people. These estimates are very low compared with published estimates of 5,200–20,000 (Parsons 1968), 9,750–46,800 (Ponce Sanginés 1981, 82), and 10,000–20,000 (Janusek 2004b, 128) and suggest that many contemporary students of Tiwanaku are returning to something approximating the empty ceremonial center model of the early twentieth century (Bennett 1934).

The estimates of the population of the Tiwanaku valley hinterland (fig. 7.1b) also ranged widely, from 7,500 to 100,000, with a mean of 34,000 and a median of 32,700. Like the estimates of the population of the urban core, these figures span an order of magnitude. However, the ratio between the estimated population of the Tiwanaku valley hinterland and that of the city itself displays a slightly narrower range of variation (fig. 7.1c). This ratio ranges from 1.2 to 10, with a mean of 3.8 and a median of 3.7. Half of the respondents (second and third quartiles) thought there were between 1.8 and 5.0 times as many people living in rural sites in the Tiwanaku valley as in the urban core.

The general picture that emerges from the participant survey is of a small or modest city located in a very densely inhabited rural landscape, with twice as many people, or more, residing in the hinterland as in the city itself. This appears to represent a consensus opinion among the

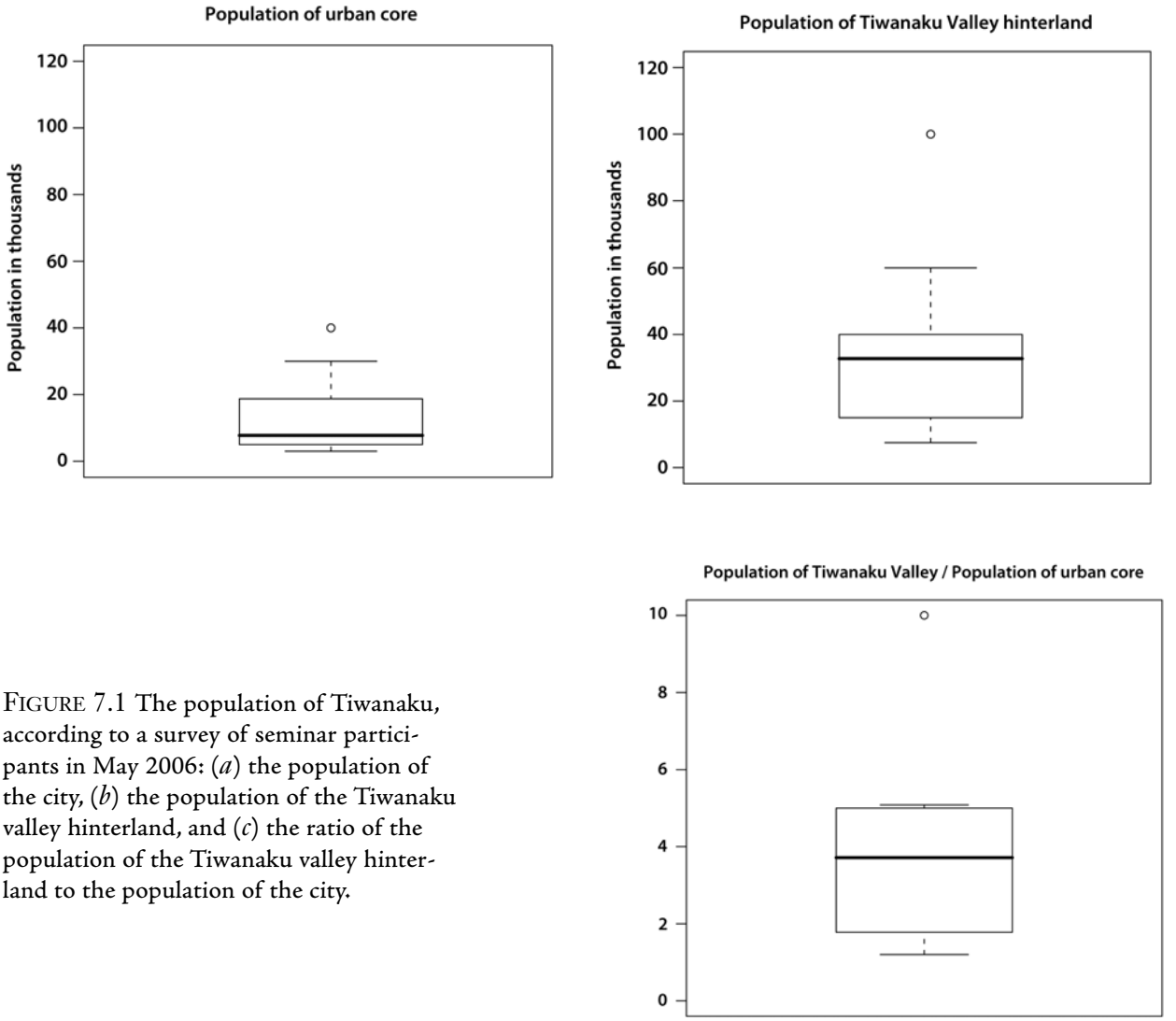


FIGURE 7.1 The population of Tiwanaku, according to a survey of seminar participants in May 2006: (*a*) the population of the city, (*b*) the population of the Tiwanaku valley hinterland, and (*c*) the ratio of the population of the Tiwanaku valley hinterland to the population of the city.

participants of the seminar, although there were a few dissenters. This view, however, is entirely untenable given our current knowledge of regional prehistory. It is untenable for two reasons: first, what we know of the size of the city of Tiwanaku and of the settlement patterns of the Tiwanaku valley clearly indicates that the urban core of Tiwanaku had at least as many inhabitants as the Tiwanaku valley hinterland, and probably many more; and second, it is becoming clear that the formation of Tiwanaku as an urban settlement predates by at least several centuries any substantial habitation in the remainder of the Tiwanaku valley.

Rural and Urban Population and Population Density

A recent reassessment of the extent of the Middle Horizon artifact scatter at Tiwanaku, undertaken by Carlos Lémuz Aguirre and myself, suggests that the city at its height covered 385 ha (table 7.1). This estimate is broadly consistent with the earlier determinations of 240 ha (Parsons 1968) and 420 ha (Ponce Sanginés 1981). Assuming that the monumental core of the city, which covers approximately 80 ha (Janusek 2004b, 130) had a negligible resident population, estimates of the survey respondents translate to population densi-

Table 7.1. Middle Horizon occupation areas for Tiwanaku and two areas of the Tiwanaku valley

Occupation Area	Area in Hectares (Bandy and Lémuz)	Area in Hectares (Other Estimates)
Tiwanaku	385	240 (Parsons 1968), 420 (Ponce 1981), 600 (Janusek 2004b,128)
Middle Tiwanaku Valley (TMV, not including Tiwanaku itself)	~ 65	120 (roughly calculated from Mathews 1992, table 39)
Lower Tiwanaku Valley (TLV)	44	120 (from Albarracín-Jordán 1992, fig. 12.5)

SOURCE: Based on recent work by the author and Carlos Lémuz Aguirre.

ties for the remainder of the city of from 10 to 131 persons per ha, with a mean of 41 and a median of 25. Estimates of urban population density in other parts of the New World include 40 (Wari), 69 (Teotihuacan), 80 (Copan), 83 (Chan Chan), 85 (Tikal), 125 (Cuzco), 133 (Tenochtitlan), and 285 (Calakmul) persons per ha (calculated from Stanish 2003, table 8.1). Most survey participants, in other words, believe that Tiwanaku was much more sparsely inhabited than were comparable urban centers in the Andes and elsewhere in the ancient world.

In contrast, survey participants seem to believe that the population density in Tiwanaku valley rural sites was much higher than that of the urban core. The total area occupied in the Tiwanaku valley during the Middle Horizon is somewhat difficult to determine due to the way in which settlement data have been collected and presented. Mathews (1992), for example, does not consistently report sizes for distinct occupations in multicomponent sites, and the method employed for measuring occupation sizes by Albarracín-Jordán (1992) is not clear. However, it is possible to arrive at a rough approximation of Middle Horizon occupation area in the Tiwanaku valley, according to these authors. These figures are presented in table 7.1. If we assume that the unsurveyed upper Tiwanaku valley had an occupation equivalent to the lower and middle valley areas (about 120 ha each under the current assumptions), then the total area occupied in the Tiwanaku valley hinterland was approximately 360 ha. It should be understood that this estimate is almost certainly too high, since the vast majority of Middle Horizon sites in the Tiwanaku valley are very small and were probably occupied only for short periods of time. We can, however, take this estimate as the upper limit of plausibility. In this case, the population estimates of the survey participants translate to population densities in rural Tiwanaku valley sites of from 21 to 278 persons per ha, with a mean of 95 and a median of 91. These figures are much higher than standard figures for rural sites in the New World (Drennan 1986; Parsons 1976) and are probably implausible.

A recent restudy of Tiwanaku valley settlement patterns by the author and Carlos Lémuz Aguirre has produced much lower Middle Horizon occupation estimates than those of the original investigators: a total of no more than 110 ha for the combined middle and lower valley areas (table 7.1). Assuming equal habitation in the upper valley, as above, produces a total of 165 ha. If this is correct, then survey participants estimated population density in rural Tiwanaku valley sites to range from 47 to 625 persons per ha, with a mean of 213 and a median of 205. Again, only the very lowest of these population density estimates is feasible from a cross-cultural perspective.

This analysis demonstrates that survey participants, on average, estimated population density at rural Tiwanaku valley sites to be from 3.1 (maximum valley occupation estimate) to 7.1 (revised valley occupation estimate) times the population density of the urban core itself. It would be extremely difficult to argue that this is a reasonable assumption, since population densities in urban centers are generally much higher than in rural hamlets and villages. The only reasonable conclusion is that the consensus view, as expressed by the survey participants, is untenable. If we assume that

population density was approximately equivalent in the urban and rural sites, as we must in the absence of data to the contrary, then the urban core of Tiwanaku accounted for between 45 percent (maximum valley occupation estimate) and 66 percent (revised valley occupation estimate) of the total Middle Horizon population of the Tiwanaku valley. Far from being a modest city embedded in a densely populated rural landscape, Tiwanaku was rather a large, dense urban nucleus that completely dominated its near hinterland demographically and probably politically as well.

Population through Time in the Tiwanaku Valley

Juan Albarracín-Jordán began a paper on the organization of settlement in the Tiwanaku valley with this observation: "urban centers evolve from, and are sustained by, a larger system of affiliated settlements" (Albarracín-Jordán 1996b, 183). This unobjectionable notion, that cities and hinterlands are mutually constituted in a long-term dialectical process, is consistent with, and perhaps lies at the root of, the consensus view refuted above: that the urban population of Tiwanaku was considerably smaller than that of its rural hinterland. It is also related to Albarracín-Jordán's argument that the settlement system of the Tiwanaku valley can be understood to reflect organizational principles characteristic of more recent periods of regional prehistory and history. This idea has been further developed by Janusek (2004b, especially chapter 2), who provides an extensive discussion of native systems of social organization, settlement systems, and political practices. Important to the understanding that both Albarracín-Jordán and Janusek have of Tiwanaku is the ethnohistoric idea of the *marka*.

Marka is an Aymara word meaning, literally, town. However, Janusek argues that the marka represents a distinctively Andean conception of urbanism. "As much as they were centers of residence for certain households, past *markas* . . . were magnet centers of political and ritual convergence for the *ayllus* residing in smaller villages and hamlets around them. They were incomplete communities inextricably tied to their surrounding hinterlands" (Janusek 2004b, 42). In a general sense, of course, this is true of any city. The idea of the marka, however, seems to have a further implication, reversing the traditional archaeological notions of city and hinterland. The marka exists to provide services to its surrounding communities, and its form and spatial layout reflect the nature of its rural constituency; they are "built icons collectively representing the *ayllus* inhabiting the smaller communities around them, with public ritual spaces focused in the central church and plaza while nearby barrios and streets were associated with specific micro-*ayllus*" (Janusek 2004b, 43). Markas are, in a sense, "owned" by their rural constituencies and comprise a mechanism and milieu serving to "anchor the coherence and identity of widely distributed imagined communities" (Janusek 2004b, 43).

The marka model of urbanism requires a large rural population. Such a population certainly existed in the Middle Horizon Tiwanaku valley, although it was not as large as is commonly believed relative to the urban population of Tiwanaku itself. To assert, however, that Tiwanaku evolved as a marka, that the origins of urbanism in the southern Titicaca Basin can be understood within the framework of the marka concept, requires there to have been a preexisting rural settlement system in relation to which Tiwanaku's urban development took place. I will argue, however, that such a pre-urban settlement system did not exist, and that Tiwanaku emerged as an urban center in the context of a rural hinterland that was essentially depopulated.

The original survey of the Tiwanaku valley (Albarracín-Jordán and Mathews 1990; Albarracín-Jordán 1992; Mathews 1992) took place before the development of a ceramic chronology adequate for the surface identification of occupations relating to the period of initial urbanism at Tiwanaku. As a result of this inadequate chronology for the Formative period, Albarracín-Jordán and Mathews defined only a single time period prior to the Middle Horizon. Their "Formative Period" settlement pattern, therefore, collapsed almost two thousand years of cultural development into a single settlement pattern. This methodological difficulty, together with several radiocarbon dates that must now be viewed as anomalous, led them to erroneously view the several

diverse ceramic styles of the Formative period as chronologically coextensive (Albarracín-Jordán 1996b, 192). However, the question of a rural population in the Late Formative remained a vexing problem for Albarracín-Jordán's model: "it is particularly difficult to assess the nature of the settlement in the valley during the first four centuries A.D." (Albarracín-Jordán 1996b, 194).

In the years since the Tiwanaku valley survey was undertaken, an improved ceramic chronology has been developed, primarily through the efforts of Lémuz Aguirre (2001) and Janusek (2003b; Bandy 2001). The time in which Tiwanaku developed as an urban settlement is now known as the Late Formative period and is divided into Late Formative 1 (LF1, 200 BC–AD 300) and 2 (LF2, AD 300–500) periods. The ceramic chronology of the Late Formative has more recently been considerably extended and refined by Steadman (2007). Assessment of the regional context of initial Tiwanaku urbanism depends upon the identification of rural occupations in the Tiwanaku valley during the LF1 and LF2 periods.

It was with this goal that Carlos Lémuz Aguirre and I initiated in 2004 a project to restudy all the Formative period sites recorded by the lower and middle Tiwanaku valley surveys (Albarracín-Jordán 1992; Mathews 1992; fig. 7.2), together with the larger Middle Horizon sites, using the improved ceramic chronology that had been developed since the early work of Albarracín-Jordán and Mathews was completed. We intended to integrate the settlement patterns in the Tiwanaku valley with those documented by the more recent Taraco Peninsula and Katari valley surveys (Bandy 2001; Janusek 2003b; fig. 7.2). The project, supported by the Heinz Family Foundation, was completed in 2004. More than one hundred sites were restudied, including all reported Formative period sites and all Middle Horizon sites greater than 2 ha in area in the lower and middle Tiwanaku valley. The project also included an assessment of the Late Formative occupation areas of the city of Tiwanaku itself. The results shed considerable light on the problem of Tiwanaku urban emergence.

The restudy of the Tiwanaku valley settlement pattern detected numerous Late Formative occupations that were not identified by the original investigators. We identified twenty-seven LF1 occupations and thirty LF2 occupations (table 7.2), almost all of them on sites reoccupied during the Middle Horizon. By way of comparison, Albarracín-Jordán and Mathews report only seventeen Tiwanaku I (roughly equivalent to LF1) and ten Tiwanaku III (roughly equivalent to LF2) occupations in the entire valley. Clearly, Albarracín-Jordán was right to suspect that the existing ceramic chronology was partly to blame for the lack of Late Formative occupations in his settlement data set. However, it is clear from the results of the restudy that the developed rural settlement

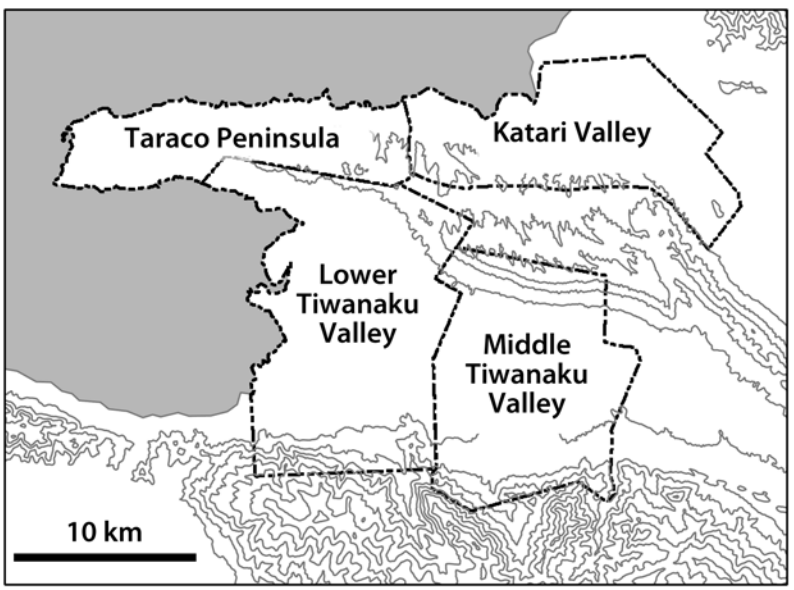


FIGURE 7.2 Archaeological survey areas in the Tiwanaku heartland.

Table 7.2. Aggregate settlement data for the Middle Formative (MF), Late Formative (LF1 and LF2), and Middle Horizon periods in the Tiwanaku Valley

	MF Sites	MF Hectares	LF1 Sites	LF1 Hectares	LF2 Sites	LF2 Hectares	MH Sites	MH Hectares
Tiwanaku	0	0	2	37	1	100	1	385
Middle Tiwanaku Valley (TMV, not including Tiwanaku itself)	16	10.9	17	8.1	16	10.2	181	~ 65
Lower Tiwanaku Valley (TLV)	22	5.4	10	2.7	14	3.3	130	43.7

SOURCE: Data are from the Lémuz Aguirre and Bandy restudy of Tiwanaku valley sites. LF2 population estimate for Tiwanaku is from Janusek (2004b, 117).

network in the Tiwanaku valley did not exist during the Late Formative. Prior to the Middle Horizon, the landscape surrounding Tiwanaku was only very sparsely inhabited.

The Tiwanaku valley restudy also allowed us to determine with more confidence the timing of Tiwanaku's initial expansion to urban size. Our reassessment of the surface scatter at Tiwanaku indicated that its initial rapid growth dated to the LF1 period. Although we cannot say when exactly this growth occurred within that long time period, I believe that it took place during the last century of the LF1, around AD 200. This is approximately the same time that the settlement system of the Taraco Peninsula was strongly disrupted and the site of Kala Uyuni, previously the center of a rival polity, was precipitously abandoned (Bandy 2006).

Tiwanaku's initial urbanization, therefore, took place in the context of a depopulated rural hinterland, and that hinterland remained largely empty of inhabitants for at least three hundred years thereafter. A substantial rural population did not exist in the Tiwanaku valley until early in the Middle Horizon. This result strongly suggests that whatever may have been the nature of Tiwanaku urbanism, it had little to do with integrating dispersed rural communities. Such communities did not exist in the Tiwanaku valley until well after the emergence of Tiwanaku as an urban center.

The City and the Country in the Tiwanaku Heartland

In light of the foregoing discussion, I feel confident in concluding that Tiwanaku did not exist in order to ritually service a rural population and to mediate and negotiate relations among dispersed ayllu groups resident in the surrounding countryside. It may have acquired that function once a rural settlement network came into existence in the Middle Horizon, but this function had nothing to do with its initial growth into a city or with the establishment of an elite social stratum resident in that city. Tiwanaku, in other words, was not a marka in the sense that the term is employed by Albarracín-Jordán and Janusek. As appealing as the ethnohistoric model may be, we must confront the likelihood that Tiwanaku represents a form of urbanism entirely unknown in more recent periods of altiplano cultural history.

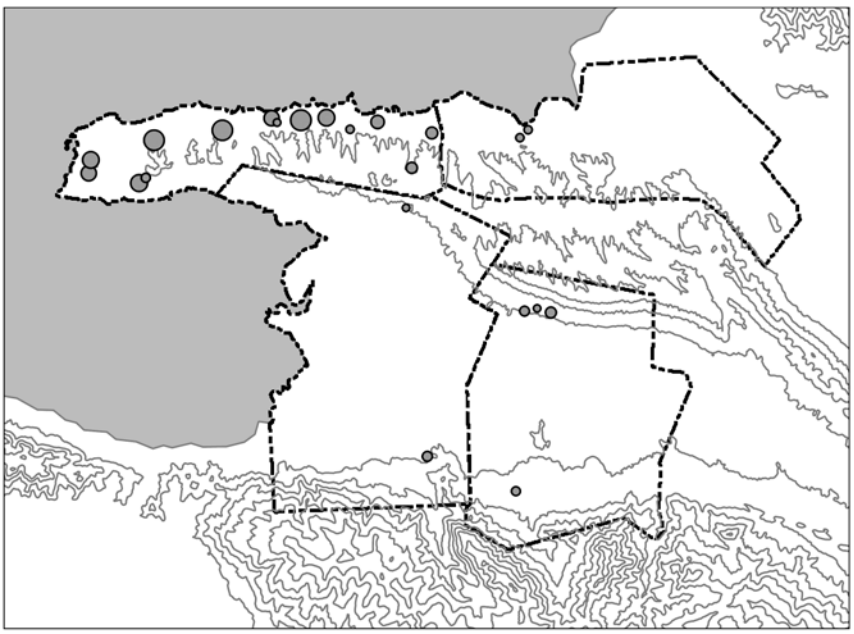
This analysis has, not of course, resolved the problem of Tiwanaku urbanism and the relation between urban and rural populations during the Middle Horizon. What I have done, however, is point out some empirical patterns that must be accounted for by any future model that is proposed. Any future model, in other words, must be consistent with the fact that Tiwanaku emerged as a city in a largely depopulated landscape, that the rural settlement system of the Tiwanaku valley was established only in the Middle Horizon and no earlier, and that even during the Middle Horizon the bulk of the Tiwanaku valley's population resided in the urban nucleus of Tiwanaku. By way of conclusion, I would like to present a model that I favor that is consistent with these facts and that can account for what we know of the development of both the city and its rural hinterland.

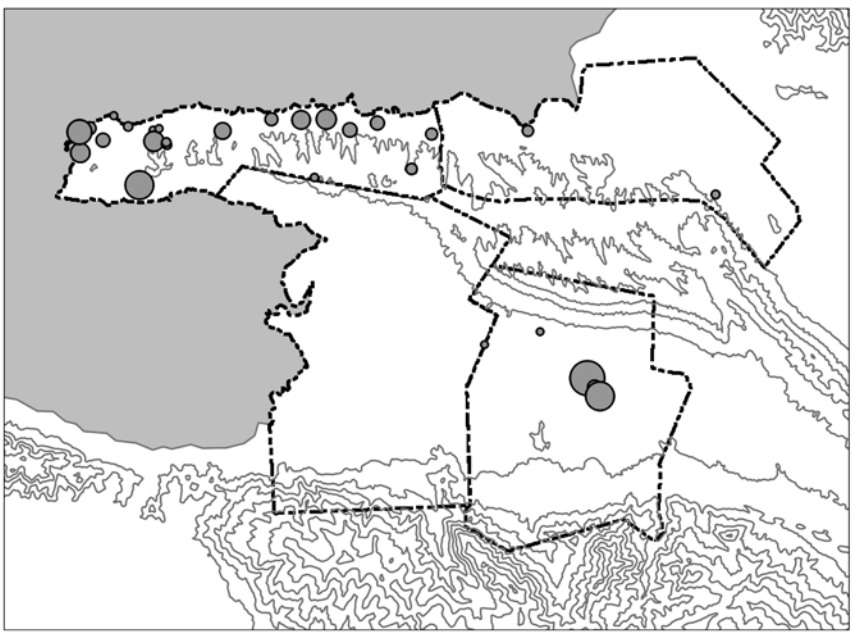
A comparison with the settlement history of the nearby Taraco Peninsula locates the Tiwanaku valley in a somewhat broader comparative

perspective. On the Taraco Peninsula, a network of large villages was in place by the Middle Formative, before 200 BC (Bandy 2001, 2006). These villages, with a few exceptions, continued to be occupied throughout the Late Formative and the Middle Horizon, and most remained locationally stable (figs. 7.3, 7.4). The Middle Horizon settlement system of the Taraco Peninsula (fig. 7.4b), therefore, displays a high degree of continuity with earlier phases of regional prehistory and underwent slow and incremental modifications over a span of more than fifteen hundred years.

The settlement history of the Tiwanaku valley is radically different and evinces major transformations when compared with the relative stability of the Taraco Peninsula system. Only a few villages of any size (> 1 ha) were occupied in the Tiwanaku valley during the Middle Formative (fig. 7.3a), all of them very small when compared with the contemporaneous villages of the Taraco Peninsula. All

(a)





(b)

FIGURE 7.3 Middle Formative (*a*) and Late Formative 1 (*b*) settlement patterns. Only sites >= 1 ha are shown, and dots are proportional to site occupation area.

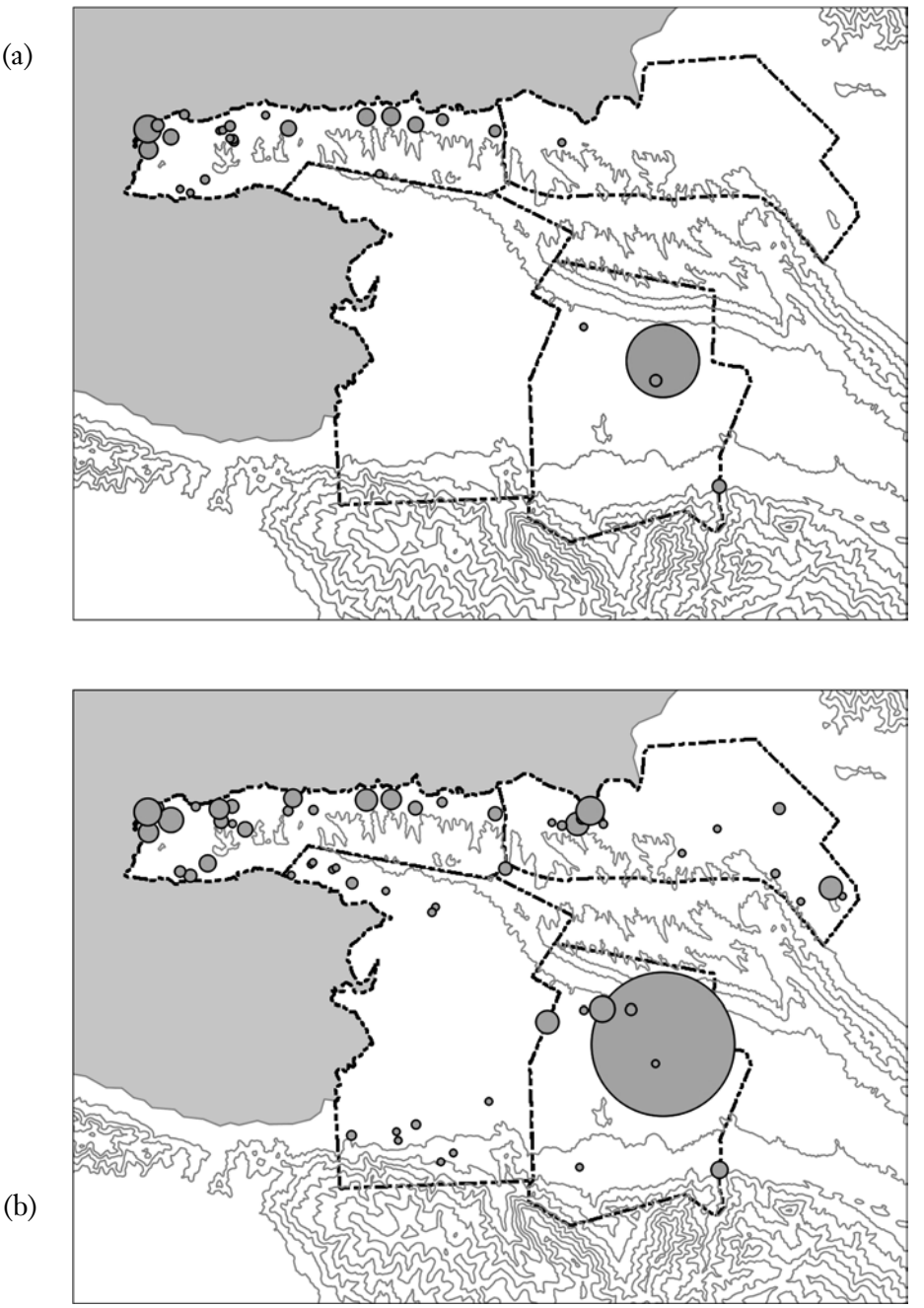


FIGURE 7.4 Late Formative 2 (*a*) and Middle Horizon (*b*) settlement patterns. Only sites >= 1 hectare are shown, and dots are proportional to site occupation area.

of these villages were abandoned or reduced to a minuscule occupation area in the Late Formative (fig. 7.3b). The growth of Tiwanaku during the LF1 had the effect of dismantling the Middle Formative settlement system of the Tiwanaku valley and concentrating the vast majority of the valley population into a single settlement: Tiwanaku. Thus, Janusek's conclusion that "unlike some pristine central cities, like Uruk in Mesopotamia and Teotihuacan in Mexico's central basin . . . , Tiwanaku's emergence did not create a demographic implosion or a rural vacuum" (Janusek 2004b, 130) needs to be reconsidered. Tiwanaku's initial expansion did indeed depopulate its rural hinterland, although it was relatively sparsely populated to begin with, and it produced a measurable demographic decline as far away as the Taraco Peninsula (Bandy 2001, 2006).

The "local landscape densely populated with clusters of smaller towns, villages, and hamlets"

(Janusek 2004b, 130) that was present in the Middle Horizon Tiwanaku valley (fig. 7.4b) was therefore a creation of the Middle Horizon Tiwanaku state. Unlike the Taraco Peninsula system, it was not an enduring network of communities and settlements with roots in the ancient past. The city was not a product or outgrowth of the nested hierarchical organization of a long-standing network of rural communities. Rather, the countryside was a reflection and a product of the development of the state and city of Tiwanaku. In the Middle Horizon, a largely vacant Tiwanaku valley was repopulated with colonists with roots perhaps in the city or perhaps elsewhere in the hinterland of the expanding Tiwanaku polity. It seems reasonable to conclude that the hierarchical organization of rural settlement in the Tiwanaku valley, so admirably documented by Albarracín-Jordán (1996b), reflects an administrative hierarchy controlling the development and functioning of agricultural estates. The creation of these estates was likely sponsored, overseen, and directed by segments of an elite landholding class resident in the city of Tiwanaku, and the agricultural surplus they generated was appropriated by these sponsoring elites.

CONCLUSIONS

On the basis of published and newly generated settlement data from the Tiwanaku valley, I have argued that the common conception of Tiwanaku as a modest city situated within a densely populated rural hinterland is invalid. Tiwanaku was home to most of the residents in the Tiwanaku valley during all periods of the Late Formative and Middle Horizon. Furthermore, a developed rural settlement network did not appear in the Tiwanaku valley until early in the Middle Horizon. Initial Tiwanaku urbanization took place in the context of a countryside largely empty of inhabitants. These two facts pose serious difficulties for any interpretation of Tiwanaku urbanism based on ethnohistoric and ethnographic markas. A more plausible scenario is that the rural settlement system of the Middle Horizon Tiwanaku valley was established as part of a colonizing process, directed by the leaders of the Tiwanaku polity, and possibly related to the development of agricultural estates in a previously uninhabited territory.

ACKNOWLEDGMENTS

I would like to thank Charles Stanish and Alexei Vranich for inviting me to participate in the seminar that gave rise to this paper and for many useful discussions of the subject. This paper has benefited from discussion with many colleagues, among whom are Amanda Cohen, Christine Hastorf, Carlos Lémuz Aguirre, José Luis Paz, John Janusek, Andrew Roddick, Deborah Blom, William Whitehead, Clark Erickson, José Capriles, and Nicole Couture. The Tiwanaku Valley restudy was funded by a grant from the Heinz Family Foundation to the author. Their support is gratefully acknowledged.

Chapter 8

What Would Celebrants See? Sky, Landscape, and Settlement Planning in the Late Formative Southern Titicaca Basin

Leonardo Benítez

This research examines the orientation, astronomical alignments, and landscape alignments of sunken courts, the hallmark architectural form of the Formative period (200 BC–AD 300) of the Andean highlands. I draw from three field seasons of measurement in the Taraco Peninsula (Kala Uyuni, Sonaje, and Chiripa), Tiwanaku valley, and Jesús de Machaca valley (Khonkho Wankane) in an attempt to compare and contrast the visual experience—that is, what people would see from these southern Titicaca Basin ritual spaces (fig. 8.1).

In this contribution, I study basic concepts in architectural design and site placement by examining alignments in and between early ritual architecture in the basin. Using archaeoastronomical methods, I examine three types of alignments at two scales: (1) local-scale alignments between architectural features and astronomical events, or between architectural features and prominent mountains; (2) landscape-scale alignments between prominent mountains and astronomical events; and (3) landscape-scale settlement alignments between ceremonial centers. By comparing and contrasting these alignments, I seek to contribute new information to the existing body of iconographic and archaeological research pertaining to the ideologies of the Late Formative period.

Methodology

Using a theodolite equipped with a solar filter and following the standard field procedure outlined by Anthony Aveni (2001) and Clive Ruggles (1999), I measured the existing architecture and natural horizons at Tiwanaku, Khonkho Wankane, Kala Uyuni, Sonaje, and Chiripa. Whenever later modifications of the landscape obstructed the view, I established an alternate datum behind the obstacle to measure the distant horizon. By remaining on the same longitudinal axis as the original datum, and with minor trigonometric adjustments to account for the changes in viewing location, I was able to reconstruct the view as seen in the Late Formative period.

I selected the twenty-two brightest stars of the southern hemisphere to test for astronomical alignments (Bauer and Dearborn 1995; Aveni and Mizrachi 1998). I also tested for alignments to the Pleiades and to the rise and set position of the sun and moon at key dates in their periodic cycles (solstices, equinoxes, lunar standstills, etc.). Stellar alignments are considered to within 1 degree, while solar and lunar alignments are considered to within 0.5 degree, a standard threshold in archaeoastronomy for solar or lunar alignments.

At the landscape scale, alignments are measured between the location of the sunken court and the most prominent mountains of the visible landscape. Mountains are ranked in order of prominence determined by the peak's apparent and actual size, geological value, and visual distinction (table 8.1). I then calculated how much distance an observer could cover perpendicular to the axis formed by the backsight and mountain foresight and still witness the landscape-scale alignment.[1]

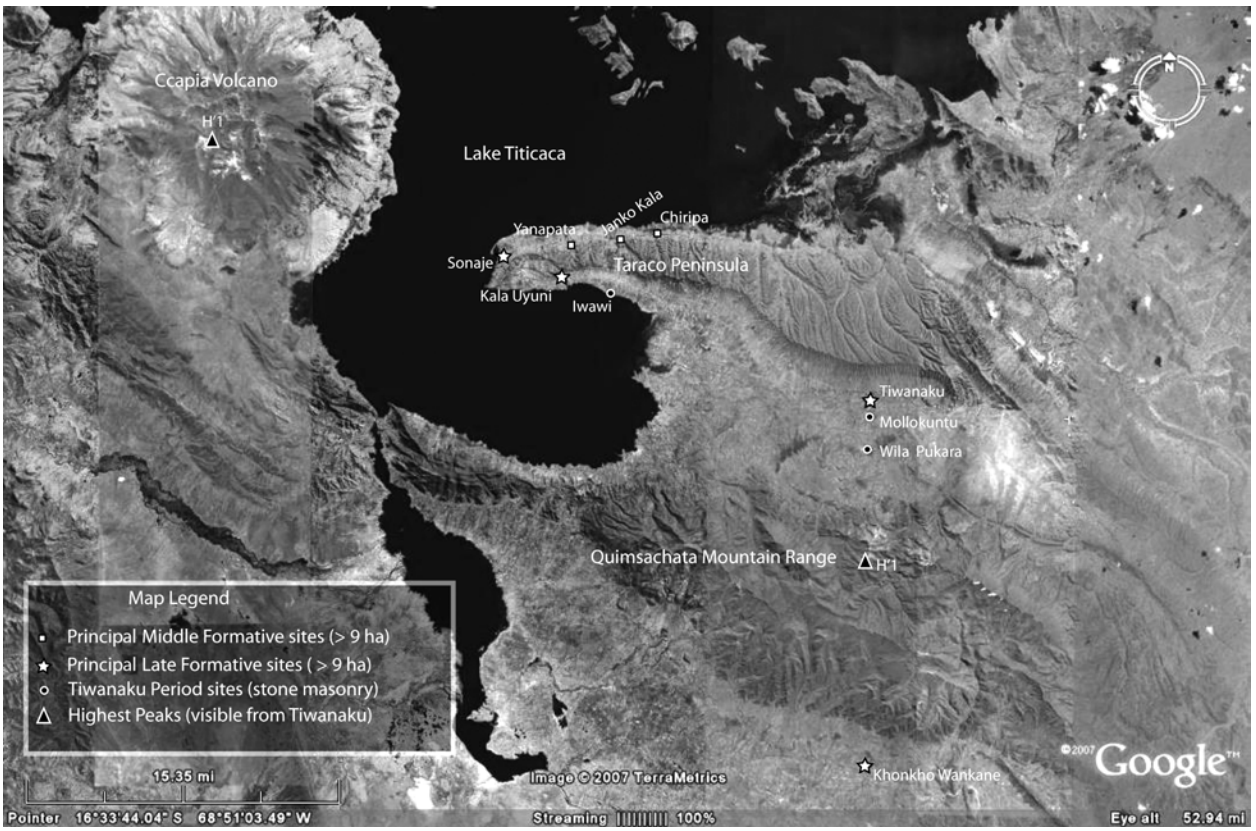


FIGURE 8.1 Map of the region studied, with locations and landscape features plotted using GPS.

Once calculated, I converted the range of where the alignment could be seen into a percentage of total habitable land of the region in question.

At the local scale, I measured alignments between select architectural features of the sunken court in question, in particular, staircases and other areas accentuated by distinctive building materials or distinctly worked stone (e.g., carvings). Staircases, due to their large and unique shape that make them unattractive for later reuse, provide a stable and in situ record of the entrances into these semisubterranean spaces (Benítez and Vranich 2005).

A simple statistical analysis can determine whether alignments at the local scale are significant (Ruggles 1999, 39, 42–43, 50–51, 68–78; Aveni 2001, 119). At both local and landscape scales, it is the accumulation of circumstantial evidence alongside the statistical probability and the functional reasons for making the observation (e.g., seasonal change and agricultural responsibilities) that determine the intentionality of the alignment.

CASE STUDIES

Chiripa

The Taraco Peninsula northwest of Tiwanaku displays the highest density of Formative period occupation and the earliest monumental construction in the southern Titicaca Basin (Bandy, chapter 7). Taraco is also the most intensively surveyed region (Bandy 2001; Hastorf et al. 1999).

The largest Middle Formative settlement is Chiripa, with its series of three culturally contoured terraces that as early as 1000 BC were accentuated through architectural construction (Hastorf 2003; Hastorf et al. 1999). To date, four sunken courts have been located at Chiripa in a 500 m^2 area. Centrally located among three earlier sunken courts is an elevated platform mound consisting of fourteen small structures or houses that enclose a 22 by 20 m central sunken court. Archaeologists attribute several building stages to this Chiripa mound and sunken court, from 800 BC to about 250 BC (Hastorf 2003; Hastorf et al.

Table 8.1. Prominence rankings of visible mountains from the regions of study

Mountain	Visible	MASL	App. Alt	Resources	Water	Snow	Isolation	Size	Geo	Vis	Score
Tiwanaku								Prominence Index			
Quimsachata	Yes	4709		Sandstone/ Copper	3 tributaries	Seasonal	No	1	2	1	4
Ccapia	Yes	4809		Andesite	No	Seasonal	Yes	1	1	1	3
Chilla	Yes	4649		Red sandstone	No	Seasonal	No	0	1	1	2
Illimani	No	6438	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chiripa								Prominence Index			
Ccapia	Yes	4809	1.6°	No	No	Seasonal	Yes	1	0	2	3
Huayna Potosi	Yes	6088	1.5°	No	No	Yes	Yes	1	0	2	3
Illampu	Yes	6368	1.4°	No	No	Yes	No	0	0	2	2
Mururata	Yes	5869	1.2°	No	No	Yes	No	0	0	2	2
Condoriri	Yes	5648	1.4°	No	No	Yes	No	0	0	2	2
Illimani	Yes	6438	1.4°	No	No	Yes	No	1	0	1	2
Khonkho								Prominence Index			
Sajama	Yes	6522	0.6°	No	No	Yes	Yes	1	0	2	3
Chijcha	Yes	~4100	0.8°	No	No	No	Yes	0	0	1	1
Vinikita	Yes	?	1.5°	No	No	No	No	0	0	1	1
Pukara	Yes	4000	6.8°	Stone	Yes	No	No	1	2	0	3

1999; Kidder 1956). Evidently, by the second century BC, the Chiripa mound and central sunken court were the principal locus for communal ritual gatherings (Hastorf 2005, 71).

In 2005, there were nineteen large sandstone and limestone blocks spaced around the perimeter of the inner sunken court. These once stood upright, interspaced by courses of smaller stones to create the inner retaining wall, as evidenced in the well-preserved northeast corner of the structure. From the lines formed by the bases of the fallen stones, I measured a mean orientation of the longer north–south axis of 1 degree east of north (or west of south). The shorter east–west axis is cardinally aligned with a miniscule deviation of 0.1 degree.

After the conquest, Spanish colonials planted non-native eucalyptus trees to mark hacienda borders; these trees now block the view of the northeast, north, and northwest horizons from the Chiripa mound. Following the methods discussed above, I reconstructed the horizons as visible in pre-Columbian times.

The most prominent mountains visible from Chiripa prior to the introduction of the eucalyptus trees were the peaks of the perennially ice-clad Cordillera Real range, particularly Huayna Potosi, the apparent single highest peak of the range visible from Chiripa. Also figuring prominently is the more local Ccapia volcano, at the southern extreme of the Copacabana Peninsula, 37 km northwest of Chiripa (fig. 8.2a).

Between 1000 and 1 BC, the peak of Huayna Potosi marked the location where the Pleiades first rose as seen from Chiripa. The distance between

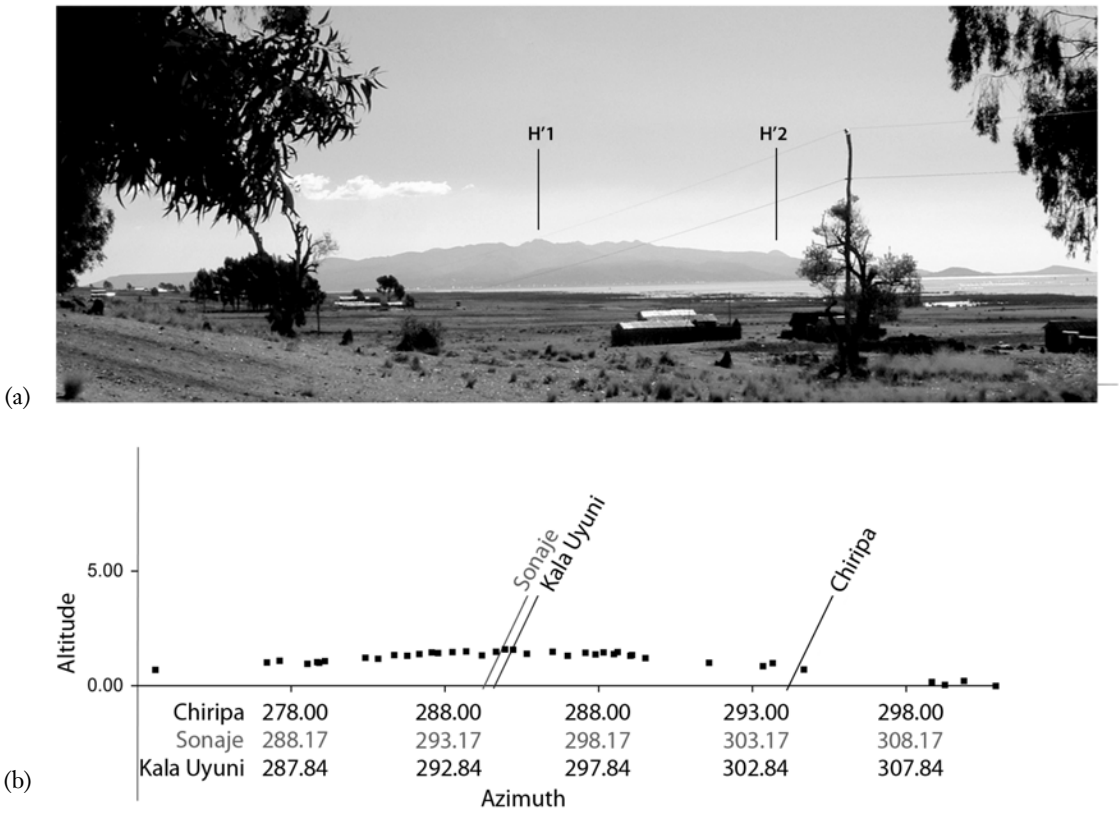


FIGURE 8.2 A sample azimuth vs. altitude plot used to re-create the visible horizon during the period in question.

the backsight (Chiripa) and the foresight (Huayna Potosi) is about 76 km; the alignment is then visible 1.5 km southeast or 1.5 km northwest from the location of Chiripa. Considering that the Taraco Peninsula only spans 7 km along this axis, the total range of 3 km indicates that 42 percent of randomly chosen locations along this axis would result in the alignment.

The Ccapia volcano is massive, and from the relatively nearby Chiripa (37 km), the volcano compromises 28 degrees (8 percent) of the northwest horizon. These 28 degrees correspond to the position of sunsets during the Andean winter months (April–October). Ccapia has two natural aberrations that I measured as potential foresights, a much more precise alignment than local-scale foresights (Ruggles 1999). The central and highest point of the volcano is an isolated peak of less than 1 degree in width (fig. 8.2a: H′1). North of this highest point is a smaller hump on the slope of the volcano that also defines a specific location (fig. 8.2a: H′2).

The central and highest peak corresponds to sunsets around May 6 and August 18 (± 1 day). Comparing these to the annual rainfall and agricultural labor curve adapted from Bandy (2001), we can measure the potential agricultural importance of these sunsets (fig. 8.3). The early May sunset occurs during the high point of the bimodal agricultural labor curve and the low point of the mean nighttime temperature curve. This is the traditional period for harvest in the southern Titicaca Basin. If the Chiripa mound were 300 m southwest or 300 m northwest of its present location, the alignment would not hold.

Seen from Chiripa, the Ccapia northern hump marks the position of sunsets during winter solstice. Like the sunset alignment to the highest peak of Ccapia, one can appreciate this alignment within the area of 300 m southwest or northwest of the Chiripa mound. The probability of a randomly chosen site procuring either of these solar alignments with Ccapia is 9 percent.

Kala Uyuni

By the Late Formative 1 period (200 BC–AD 300), the population of the Taraco Peninsula had

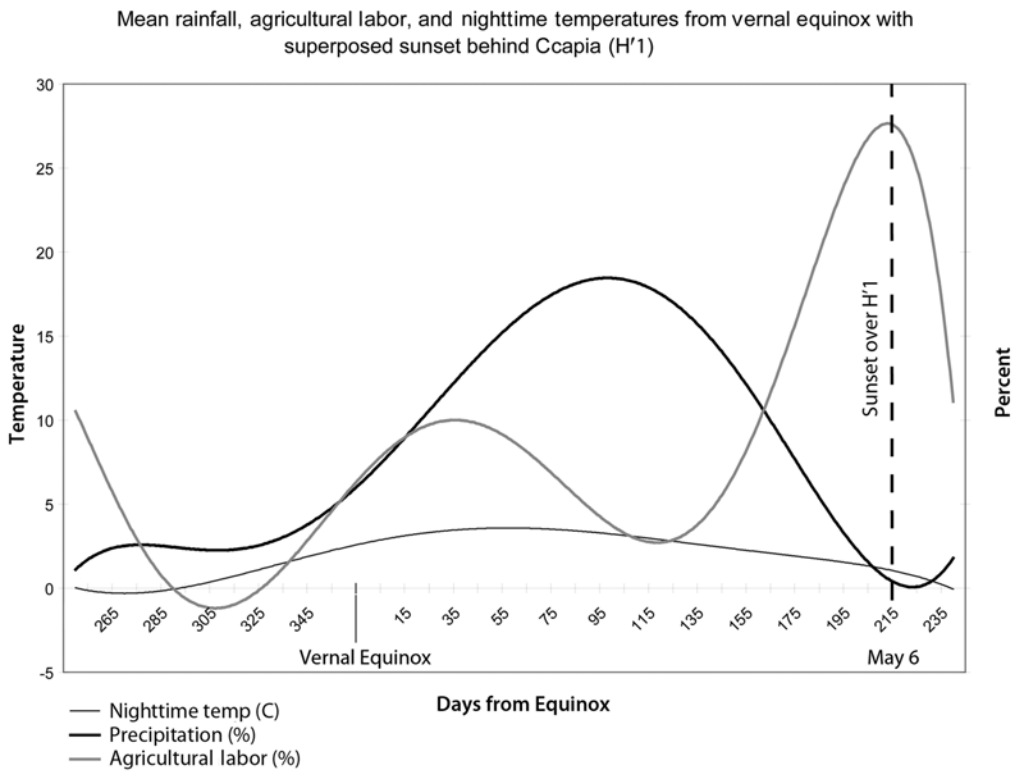


FIGURE 8.3 Annual rainfall and agricultural labor curve with superimposed date of sunset behind the highest peak of Ccapia (H'1) (Bandy 2001).

shifted southward; hence Kala Uyuni, Sonaje, and the Santa Rosa group became the principal communal centers for the evolving Taraco polity (Bandy 2001, 162–204). The large site of Kala Uyuni on the southern slope of the Taraco Peninsula was initially occupied in the Middle Formative and reached its highest population index in the Late Formative 1. A dual sunken-court complex dating to the Middle Formative lies atop a natural hill, while the Late Formative occupation appears to have been primarily domestic at the base of this hill. Like the Chiripa sunken court, the Kala Uyuni courts share the same architectural construction of large uprights interspaced by smaller coursed stones.

The shift in settlement to the southern slope of the peninsula resulted in the highest and central peak of Ccapia marking the winter solstice sunset. This alignment can be appreciated 257 m east and west of the present location of Kala Uyuni with an 8 percent probability of a randomly chosen site procuring the alignment. I should mention that the ceremonial platform of Sonaje, identified as the co-capital with Kala Uyuni of the Taraco polity during the Late Formative period (Bandy 2001, 192), also shares this winter solstice alignment to the highest peak of Ccapia (fig. 8.2b).

Khonkho Wankane

Located in the Jesús de Machaca valley 45 km south-southeast of the Taraco Peninsula, Khonkho Wankane was one of the major Late Formative ceremonial centers in the southern Titicaca Basin. Khonkho Wankane is a complex archaeological site with several plazas, platforms, and sunken courts built atop an artificial mound (Janusek 2006, Smith, chapter 3). This structure of stone masonry is similar to the Taraco sunken courts; it consists of some large uprights spaced by coursed ashlars. At Khonkho Wankane there is archaeological evidence for several stepped entrances (fig. 8.4).

Although a large percentage of the sunken court remains beneath the surface, previous excavations have relocated the walls and corners of the structure (Janusek and Pérez 2005). As a result, I

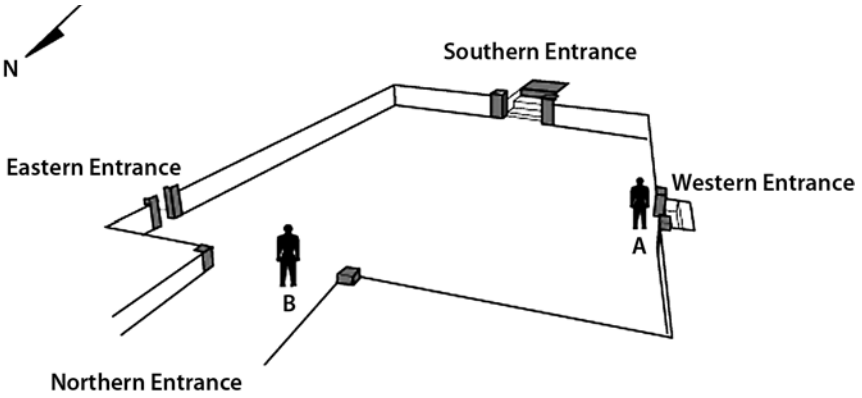


FIGURE 8.4 The entrances of the Khonkho Wankane sunken court.

Table 8.2. Potential foresights from the entrances of the Khonkho Wankane sunken court for the rise of celestial bodies prominent in Andean ethnohistoric and ethnographic documentation

From Western Entrance Backsight				Azimuth of Celestial Events at μAltitude					
Foresight	Azimuth Span	μ Altitude	Alignment	200 BC	100 BC	AD 1	AD 100	AD 200	AD 300
North Entrance	46.89°–52.98°	3.66°	Vega	47.81°	47.90°	47.97°	48.04°	48.09°	48.15°
East Entrance	63.92°–65.39°	2.35°	Winter solstice sunrise	64.44°	64.45°	64.47°	64.48°	64.48°	64.50°
South Entrance	136.48°–144.27°	1.95°	α Centauri rise	142.51°	143.08°	143.68°	144.26°	144.83°	145.42°
South Entrance	137.48°–144.27°	1.95°	β Centauri rise	140.78°	141.39°	142.04°	142.64°	143.26°	143.87°

Note: Underline denotes a non-alignment.

was able to measure the dimensions and orientation of the sunken court by partially exposing the corners and in situ stone blocks. The sunken court is very irregular in design: the north (21.75 m) and south (21.61 m) walls are nearly cardinal (0.2 degree combined error), whereas the longer east (26.16 m) and west (26.90 m) walls taper inward 5 degrees toward the south, creating a trapezoidal court.

Previous excavations revealed a well-labored entrance on the southern wall consisting of large andesite stone uprights flanking steps (fig. 8.5a). This southern staircase noticeably deviates 1.3 m west from the center point of the southern wall. A similar, but smaller entrance exists in the center of the western wall, also flanked by two uprights. The eastern half of the northern wall has a third entrance that may have provided access to the sunken court via a northern corridor. Situated in the northern corner of the eastern wall is the fourth and smallest of the entrances.

After the initial analysis, I realized that the only statistically significant backsight for local-scale astronomical alignments is the western entrance (fig. 8.4A). From here, the other three entrances all function as potential foresights for the rise of celestial bodies prominent in Andean ethnohistoric and ethnographic documentation (table 8.2). From the western entrance, the small eastern entrance corresponds to the location of the winter solstice sunrise. Seen from the western entrance, the northern corridor marks a much larger region of the sky (6 degrees), the center of which corresponds to the rise of Vega, the brightest star in the northern half of the Andean altiplano sky in the western constellation of Lyra.[2] From the western entrance, the upright stone blocks of the southern entrance frame the region

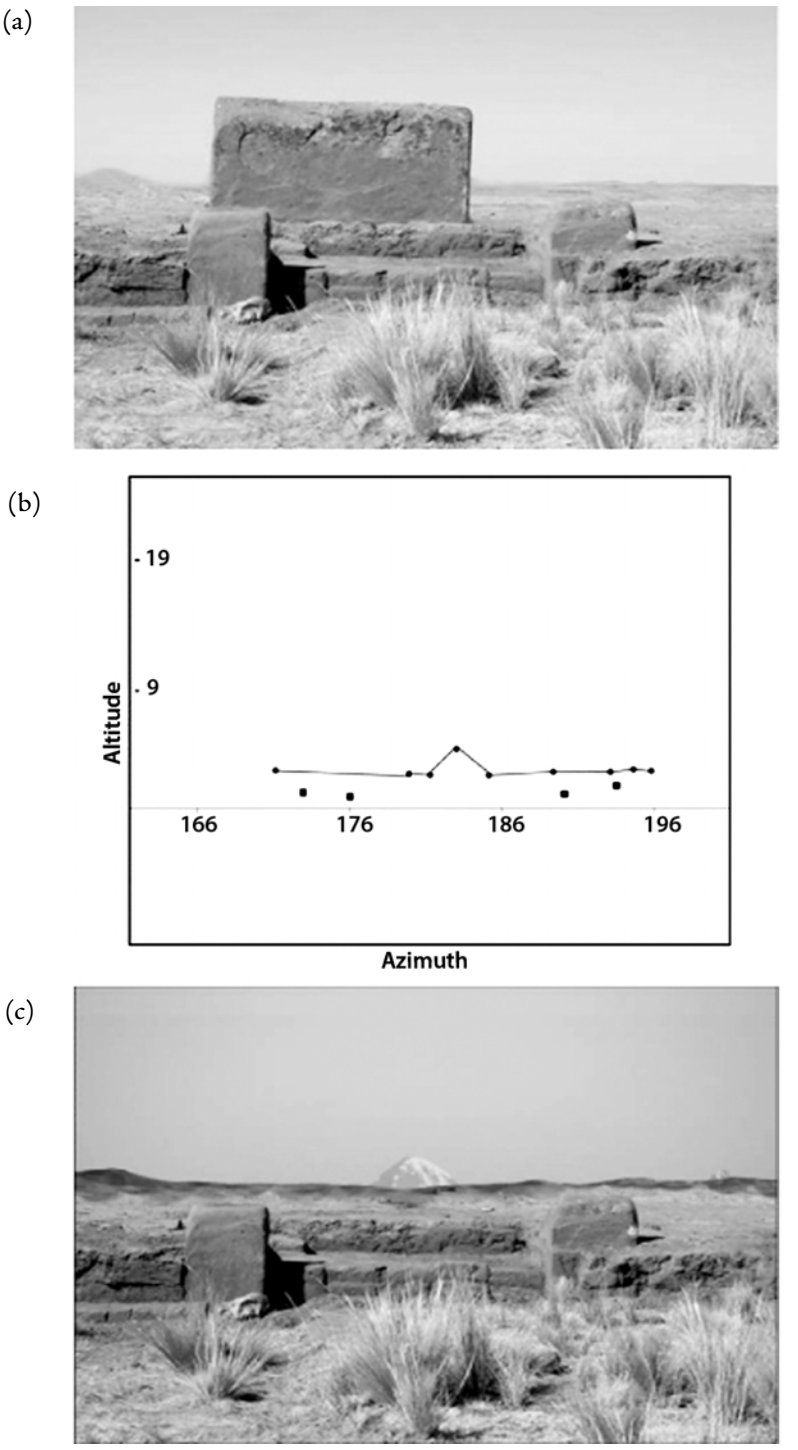


FIGURE 8.5 View from inside the sunken court at Khonkho, looking south (*a*). A block of stone that is not in situ presently obscures the view of the Sajama mountain. The following figure (*b*) is a laser-transit measurement of the horizon formed by the orthostats of the sunken court and the form (peak in the approximate center) of the Sajama mountain. The final image (*c*) is a view from the sunken court with the obscuring stone from the first image (*a*) digitally removed.

of the sky that corresponds to the rise position of the bright stars Alpha and Beta Centauri in the center of the Milky Way (fig. 8.6).

The northern entrance as a backsight does not present any convincing astronomical alignments; however, there are two potential visual geographic alignments (fig. 8.4B). From this perspective, the uprights of the southern entrance frame the distant ice-clad Sajama (fig. 8.5c), and the western entrance similarly frames the local peak Chijcha. Sajama received the highest prominence score of all the peaks visible from Khonkho Wankane (table 8.1); Chijcha did not score high at all, but the indigenous people of Khonkho

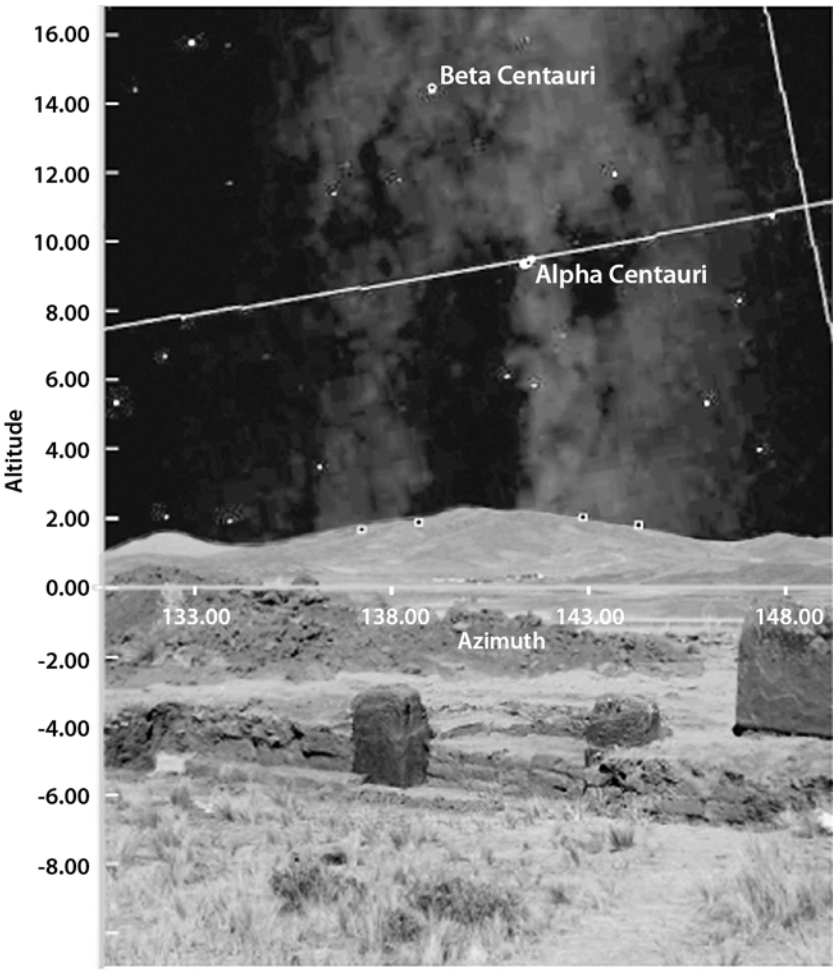


FIGURE 8.6 Location of Alpha Centauri from the western entrance of the Khonkho sunken court. A computer rendering of the night sky has been added to show the form of the dark constellation of the llama in relation to the southern entrance.

Wankane tell us that the peak was sacred to their ancestors and that there are material remains on the summit (Smith, personal communication).

The study at Khonkho Wankane did not yield any landscape-scale alignments between mountains and celestial bodies. However, a similar long-distance settlement alignment between the sunken court at Khonkho Wankane and the Tiwanaku sunken court is discussed in a later section of this chapter.

Tiwanaku

Centuries of looting and questionable reconstructions of the monuments at Tiwanaku make it imperative to use archival records and field documentation of previous excavations to identify the original architecture (Bentley, chapter 10). Fortunately, the excavations and restoration of the Tiwanaku sunken court are well documented in a single publication, including pre- and post-reconstruction photographs (Ponce Sanginés 1964). All of the architectural features presented in this chapter are in situ, as evident in the published pre-reconstruction field notes, photographs, and illustrations (Ponce Sanginés 1964).

At 28 by 26 m, the Tiwanaku sunken court (henceforth *Templete*) is the largest of the sunken courts examined (fig. 8.7). Similar to the other sunken courts discussed, the retaining walls consist of large sandstone uprights interspaced among coursed stones. The long axis is north–south, and its orientation is 2 degrees east of north (or west of south). The shorter east–west axis is nearly cardinal (error of 0.4 degree). The only entrance into the building is to the south, a large sandstone staircase flanked by the two largest uprights. Its massive and sole presence accentuates the north–south axis. As is the case with the entrances of the Khonkho Wankane sunken court, the Templete staircase is noticeably off center (85 cm east of center).

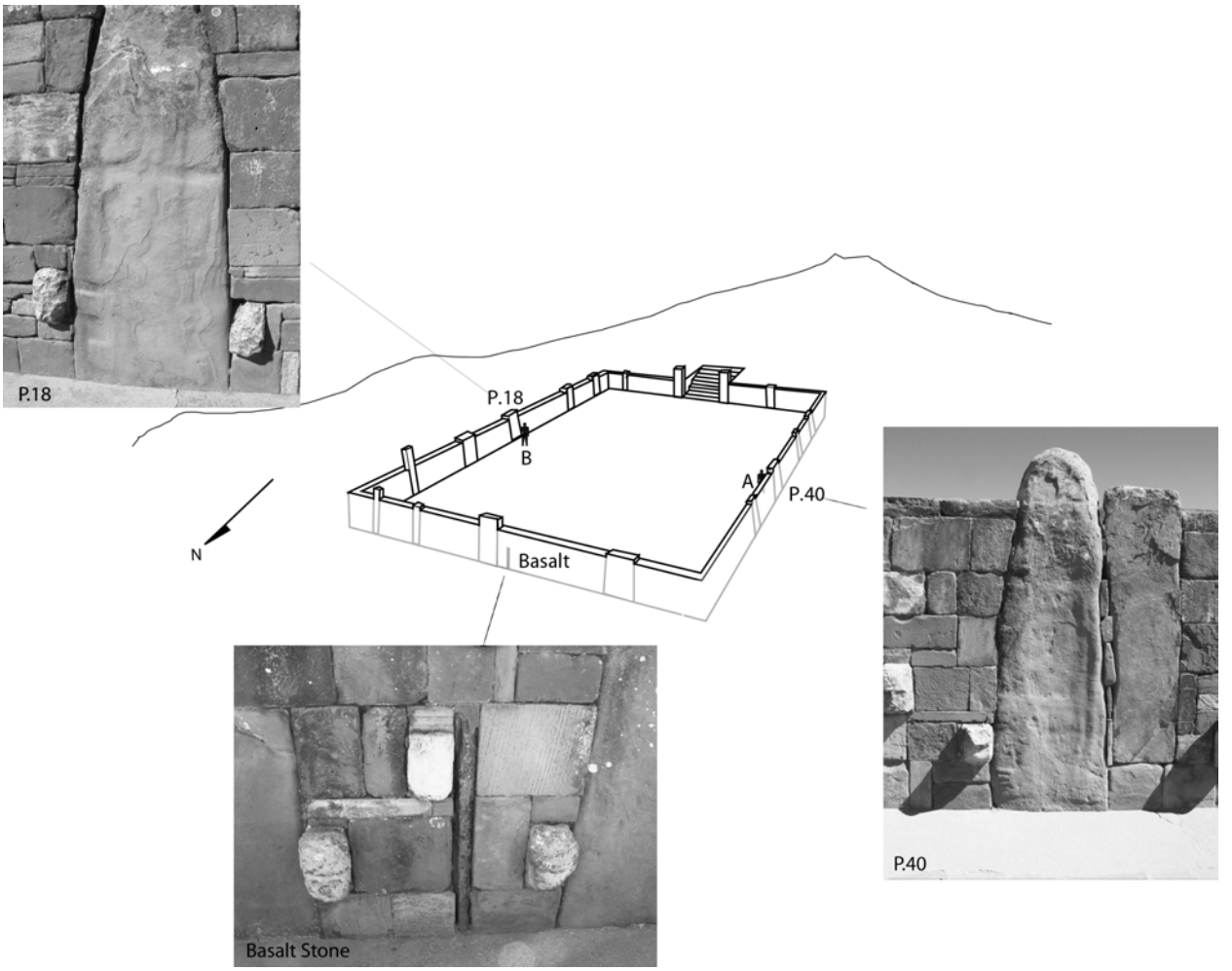


FIGURE 8.7 The Tiwanaku Templete.

Large sandstone uprights with the remains of carved iconography are in the approximate centers of the western and eastern walls (Ponce Sanginés 1964, 61–62). The center of the northern wall corresponds to a unique black basalt stone slab, the only basalt and dark-colored stone in the structure. I selected these stones along with the southern staircase for measurements at the local scale.

Later modifications at Tiwanaku now block significant portions of the horizon as seen from the Templete. The later constructions of the Kalasasaya (AD 300–500) and Akapana platforms (AD 600–800) obstruct the view of the western and southern horizons. Once I reconstructed the horizon as extant prior to the construction of these later monuments, I was able to test for astronomical alignments between the backsights and foresights. (See chapter 11 for an updated chronology of on-site monumental constructions.)

From the western iconographic stone (fig. 8.8a), the eastern iconographic stone marks the equinox sunrise. Similarly, from the eastern stone (fig. 8.8b), the western stone marks the equinox sunset. This axis divides the sky into a northern and southern hemisphere and heralds the transition from winter to summer and vice versa (table 8.3). Furthermore, from both of these stones (west and east), the southern staircase acts as a foresight to frame the rise and setting of the bright stars Alpha and Beta Centauri (fig. 8.8).

The Tiwanaku Templete also presents evidence of a visual alignment to a mountain similar to those at Khonkho Wankane. This became evident when

Table 8.3. Equinox sunrise and sunset from the western and eastern iconographic stones of the Tiwanaku Templete

Foresight	Azimuth Span	μ Altitude	Alignment	200 BC	100 BC	AD 1	AD 100	AD 200	AD 300
From Western Iconographic Stone Backsight (P40)				Azimuth of Celestial Events at μ Altitude					
P18	89.70°	1.60°	Equinox sunrise	89.57°	89.45°	89.76°	89.66°	89.54°	89.43°
South Entrance	133.96°–147.79°	2.14°	α Centauri rise	142.33°	142.90°	143.49°	144.07°	144.65°	145.23°
South Entrance	133.96°–147.79°	2.14°	β Centauri rise	140.63°	141.22°	141.84°	142.46°	143.07°	143.69°
From Eastern Iconography Stone Backsight (P18)				Azimuth of Celestial Events at μAltitude					
P40	270.16°	2.05°	Equinox sunset	270.40°	270.48°	270.59°	270.28°	270.38°	270.49°
South Entrance	215.15°–227.57°	2.33°	α Centauri set	217.78°	217.21°	216.60°	216.04°	215.45°	<u>214.88°</u>
South Entrance	215.15°–227.57°	2.33°	β Centauri set	219.46°	218.86°	218.24°	217.63°	217.01°	216.40°

Note: Underline denotes a non-alignment.

reconstructing the southern horizon prior to the construction of the Akapana pyramid. During the Late Formative period, the uprights of the southern staircase isolated and framed Quimsachata, the highest peak of the southern range (fig. 8.9). Quimsachata is the largest local peak for Tiwanaku, and based on its geological value (as a source for sandstone), potable water, apparent size, and seasonal snow accumulation, it received the highest prominence score. Most celebrants would have experienced the visual alignment to Quimsachata from the center of the Templete or as they exited the structure. This slightly skewed axis runs from the highest peak of Quimsachata and through the uprights of the southern staircase directly to the unique basalt stone mentioned earlier.

This visual Quimsachata alignment also has an astronomical value. The alignment from the basalt stone to the highest peak of Quimsachata is precisely along the celestial meridian. As a result, the southern celestial pole is directly above Quimsachata, and the northern celestial pole is below the basalt stone. An observer looking south from the Templete would have seen the stars and the Milky Way rotate around this axis and circle about a point directly above the highest peak of Quimsachata (fig. 8.10). Taking into consideration the east–west dimension (26 m) of the Templete, we can calculate a 0.06 degree variation in the alignment for observers anywhere within the structure. For the purposes of naked-eye observation, this variation is negligible. All celebrants within the Templete could have witnessed the night sky rotate around the highest peak of Quimsachata. However, had the location of the Templete been east or west of the present location, the alignment of Quimsachata and the celestial pole would not have held. In fact, given a generous 1 degree error margin, an observer would only have seen the alignment 210 m east or west of the Templete. Based on the east–west (32 km) dimensions of the Tiwanaku valley, there

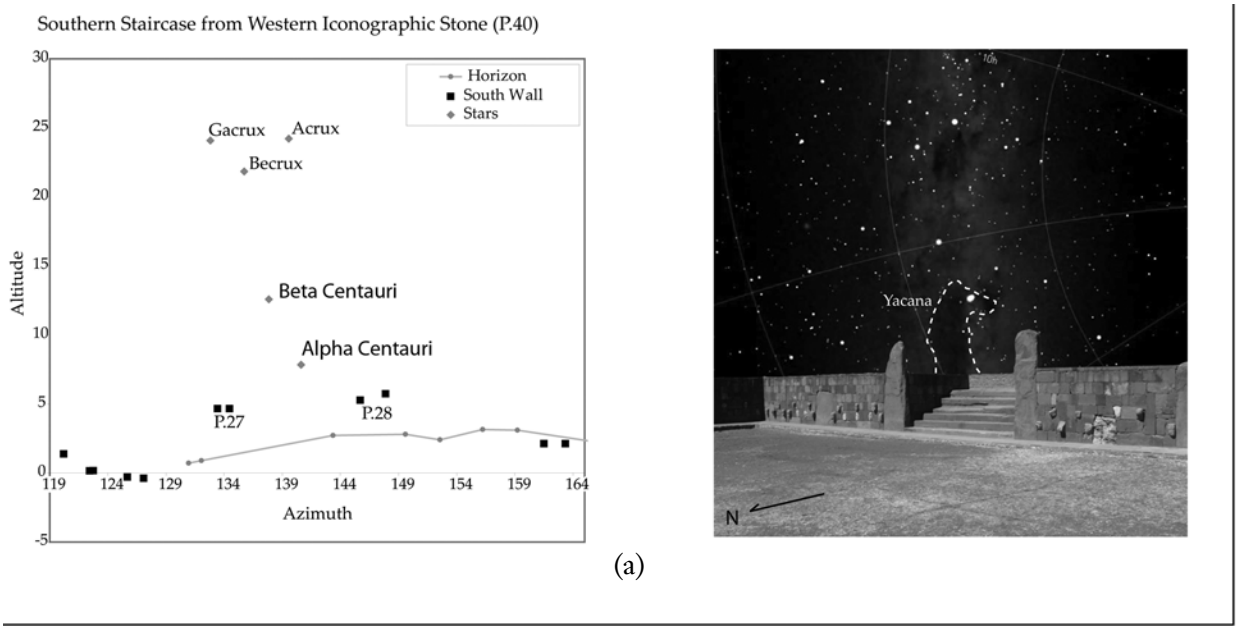


FIGURE 8.8 Reconstruction of the southern horizon seen from the Templete during the Late Formative period (prior to the construction of the Akapana platform).

is roughly a 1 percent (P = 0.012) chance that a randomly chosen location would result in this alignment.

Now turning to the west, the highest peak of Ccapia (H′1) coincides with the setting position of the winter solstice sun (fig. 8.11). Because of the distance between Tiwanaku and Ccapia (60 km), one can appreciate the winter solstice sunset alignment with negligible variation (less than 0.5 degree) 122 m north and south of the Templete. In the Tiwanaku valley that spans 15 km north–south, there is approximately a 2 percent (P = 0.016) chance that a randomly chosen location would procure this alignment.

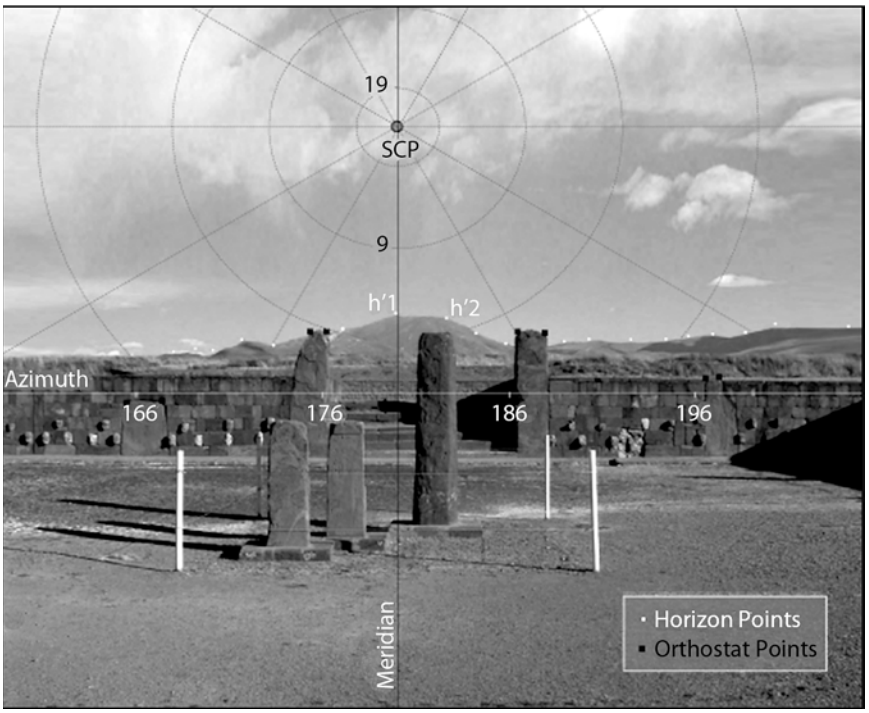


FIGURE 8.9 Reconstructed view of the southern horizon from the Templete prior to the construction of the Akapana platform. The southern pole (SCP) is located directly above the Quimsachata.

FIGURE 8.10 Long-exposure photograph of Quimsachata and the celestial pole from atop the Akapana platform in line with the basalt stone of the Templete. *Photograph by Ken Roberson, 2006.*

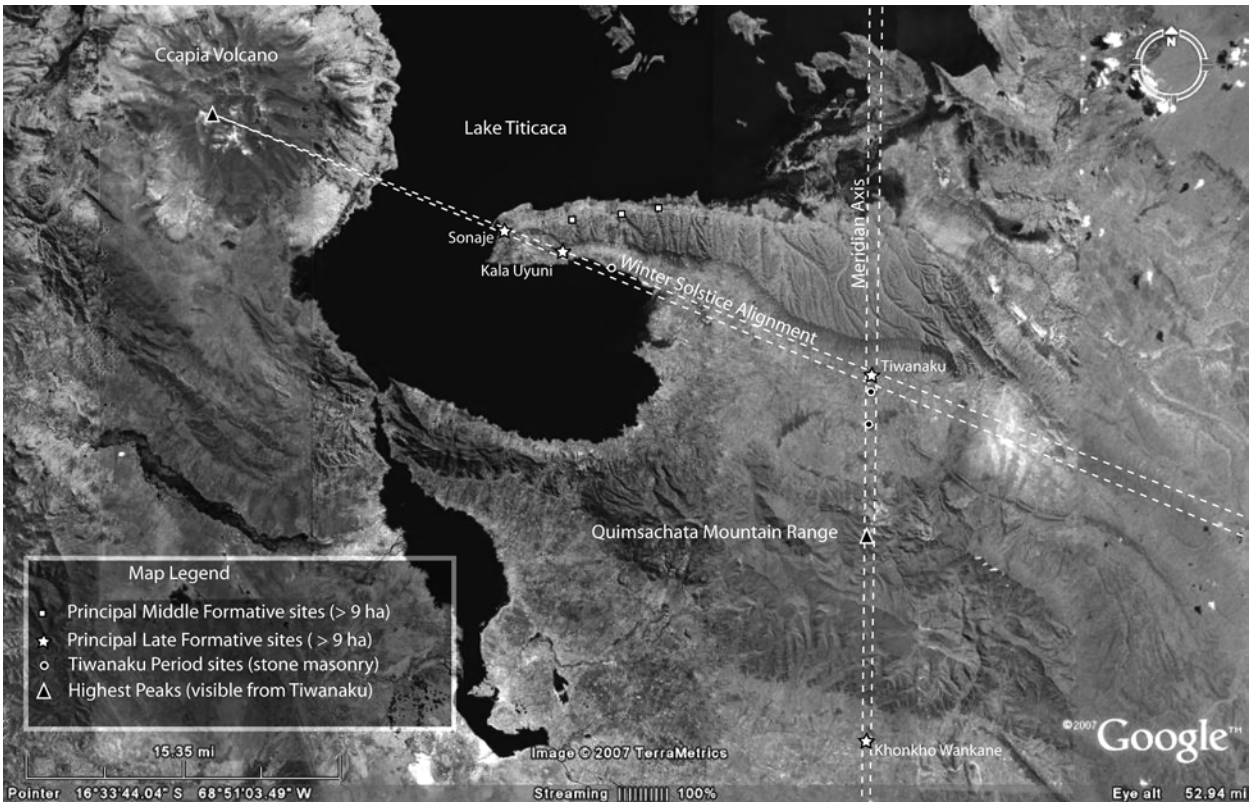


FIGURE 8.11 Locations in the Tiwanaku valley where observers can see the Ccapia winter solstice and the Quimsachata/southern pole alignments

DISCUSSION

The sunken courts examined all share the common function of a small enclosed ritual space for periodic communal gathering and ritual feasting (Hastorf 2005, 76–80; Steadman 1997; Chávez 2004; Couture 2004; Bandy 2001; Dietler and Hayden 2001) and the construction technique of uprights interspaced by smaller courses of stone and a long north–south axis. It is difficult to determine a pattern of orientation, but all have a cardinal or nearly cardinal (± 0.5 degree) short east–west axis and vary (± –5 degrees) in the orientation of the longer north–south axis. The sunken courts at Khonkho Wankane and Tiwanaku display an interest in visual alignments framing prominent peaks of the local landscape between the upright blocks of a staircase. This could not be tested for the sunken courts of the Taraco Peninsula, since the entrances are not apparent. All the courts have potential alignments to the winter solstice, but the foresights (as in the landscape point of reference) differ.

Local-Scale Alignments

In terms of the local-scale alignments, the Khonkho Wankane and Tiwanaku sunken courts both have a displaced southern staircase that results in alignments to the central region of the Milky Way (Alpha and Beta Centauri). These stars correspond to the ethnohistorically and ethnographically documented Andean dark-cloud llama constellation known by the Quechua name of Yacana (Urton 1981; Bauer and Dearborn 1995); in fact, these stars are commonly called Llamacnawin (literally, "eyes of the llama").

Beyond any symbolic value that the Yacana constellation may have had during Inca times (Salomon and Urioste 1991, 372), its functional use in anticipating the life patterns of llamas and agropastoral peoples cannot be overlooked (Urton 1981, 119–23). Herders and farmers still observe the first appearance and disappearance of this constellation, an event that astronomers call the heliacal rise and set. During the Late Formative period the heliacal rise and set of the

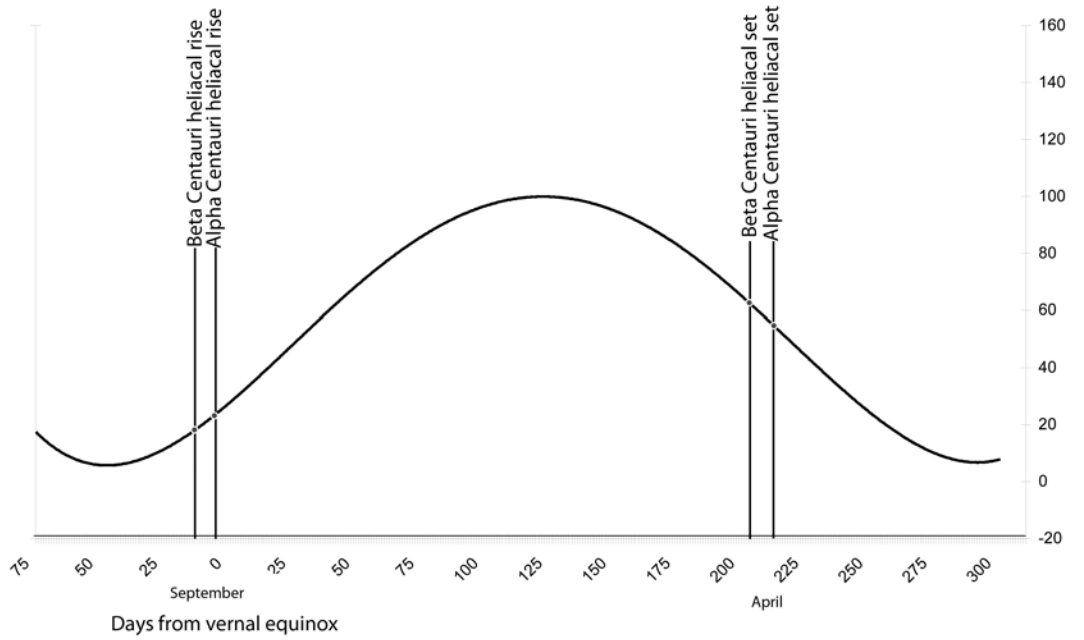


FIGURE 8.12 Annual rainfall curve and the heliacal rise and set of Alpha and Beta Centauri in the southern Titicaca Basin (c. AD 100).

Yacana constellation occurred at the beginning and end of the rainy season (fig. 8.12). Consequently, there are functional incentives for its observation due to the climactic correlation. This, combined with the statistical results and the rejection of aesthetic symmetry to benefit this demonstrably important alignment, leads me to conclude that these alignments and the geometric asymmetries of the southern entrances were intentional.

Landscape-Scale Alignments

At Chiripa, the landscape-scale alignment between the Pleiades and Huayna Potosi is backed by ethnohistoric and ethnographic records, but due to the underwhelming probability (42 percent), I reject the intentionality of the alignment. However, there is clearly a pattern in the Early and Middle Formative periods of settlement on the northern slope of the Taraco Peninsula (Bandy 2001). A simple and practical explanation for this is that during the winter months the northern slope receives more sunlight and is therefore a warmer environment than the southern slope. Most locations along the northern slope would result in both of the solar alignments against Ccapia, so finding a unique location where observers could witness them was not a critical criterion in choosing a location to build.

The Ccapia winter solstice alignment seen from Kala Uyuni is promising (8 percent probability), especially given the contemporary alignment at Sonaje. The compound probability of these two sites, the two most populated Taraco ceremonial sites during the Late Formative (Bandy 2001, 174–86), randomly being able to witness the winter solstice sunset behind the highest peak of Ccapia is less than 1 percent ($P < 0.001$). As with the Chiripa alignments, the importance of the winter solstice to Andean agricultural communities and the proximity of Ccapia to the Taraco Peninsula do make a strong case for the celebrants observing and over time likely attributing meaning to the alignment.

Settlement Alignments

Remarkably, the sites of Tiwanaku and Khonkho Wankane share the same longitude (68°40′21″, ± 1″; they are precisely due north and south from each other. The highest peak of Quimsachata approximates the midpoint. At this latitude, 1 arc-

second of longitude is less than 30 m; thus we are talking about a combined error of less than 60 m across 28 km of mountainous terrain, an achievement that implies a high degree of planning and foresight in the construction of both these centers.

Following the growing trend of phenomenological and performance archaeology, we can frame this settlement alignment within an individual's experience (Tilley 1994; Vranich 2002; Inomata and Coben 2006):

> Exiting the Tiwanaku Templete, the individual sees Quimsachata framed between the flanking uprights of the southern staircase. Following this mountain as a visual beacon, the individual walks along a projection of the celestial meridian, with the southern celestial pole directly in front (above Quimsachata), and the northern celestial pole directly behind (below the Templete). Depending on the time of day, the sun, moon, and/or stars appear to pivot around the celestial pole above the sacred peak and around the path traveled (about five hours from Tiwanaku to the top of Quimsachata). Arriving at Quimsachata, the individual is roughly halfway to Khonkho Wankane and, for the first time, can see the ice-clad tip of Sajama emerging above the hills to the south. Following this axis (perhaps using Sajama as a landmark), and using the celestial pole as a guide, the individual enters the Jesus de Machaca valley, arriving at Khonkho Wankane. If we assume that the individual follows the linear north–south direction and enters the sunken court from the northern entrance, upon entering, the individual sees the southern staircase frame the majestic peak of Sajama, the highest mountain in Bolivia. This brings the journey full circle, as it begins with a visual alignment to the highest mountain of the local southern horizon (Quimsachata) and ends with a visual alignment to the highest mountain of the south-central Andes (Sajama), also rising in the south.

That all the monuments at Khonkho Wankane were built atop an artificially constructed mound further supports the intentionality behind this axis; the builders chose a particular location in the Jesús de Machaca valley to build an artificial mound that also coincides with the longitude of Tiwanaku. The compound probability of the Khonkho-Tiwanaku-Quimsachata-celestial pole alignment has a virtual 0 percent probability ($P < 0.001$) of randomly occurring.

There are no local-scale astronomical similarities between the Khonkho Wankane or Tiwanaku sunken courts and those of the Taraco Peninsula. However, the landscape-scale Tiwanaku Templete and Ccapia winter solstice alignment adds some insight into the alignments of the Late Formative Taraco Peninsula. To what extent the Formative communities of the Taraco Peninsula intentionally chose site locations based on sunsets behind Ccapia is less secure due to the limited size of the Taraco Peninsula; nonetheless, we can be certain that the Formative agriculturalists of the peninsula would have appreciated the winter solstice sunset behind the volcano centuries before the construction of the Tiwanaku Templete. The probability of the three Late Formative sites (Sonaje, Kala Uyuni, and Tiwanaku) all randomly coinciding with an alignment to Ccapia is once again virtually 0 percent ($P < 0.001$). As a result, I argue that the Tiwanaku-Ccapia winter solstice alignment pertains to a Late Formative lakeside tradition that may have derived from earlier observations and associations to the winter sun and Ccapia emerging from the Taraco Peninsula, and perhaps more directly from the solstice observations at Kala Uyuni and Sonaje. Bandy (chapter 7) proposes that the rise of Tiwanaku was the result of a slow migration from the Taraco Peninsula. Perhaps such cosmological similarities in both locations facilitated this migration; one could even propose that some aspects of the Tiwanaku ideology/cosmology originated among the lakeside traditions of Taraco.

CONCLUSION

In terms of its relation to the sky and landscape, the Tiwanaku Templete is a combination of the Khonkho Wankane sunken court and those of the Taraco Peninsula. Shared with Khonkho Wankane is the architectural framing of prominent peaks in the local landscape and the alignments to

the Yacana dark-cloud constellation. Sunken courts of Tiwanaku and the Taraco Peninsula share the landscape-scale alignment of the winter solstice sun to the Ccapia volcano.

The construction of the Kalasasaya platform usurped the winter solstice alignment of Ccapia and the Templete, replacing the western horizon with the platform's own mass. Also during this period, the stonemasons of Tiwanaku began to incorporate andesite stone quarried from Ccapia to accentuate features associated with solar observation. For celebrants in the Templete, the focus was no longer on the winter solstice sunset behind Ccapia, but rather on the sunsets behind the Kalasasaya. Only from inside the Kalasasaya or farther east toward the Kantatallita could one see the distant volcano (Vranich 2009). Similarly, the construction of the Akapana platform completely obstructed the alignment with Quimsachata and the southern celestial pole. Rather than the sacred mountain representing the celestial pivot, the manufactured Akapana platform replaced the landscape feature and quite literally became the axis mundi. With the completion of the Kalasasaya and the Akapana, the builders redefined the sacred nature of the Templete, articulated by the natural landscape alignments, and shifted the focus inward onto the city itself.

The location of Tiwanaku enabled celebrants to witness the interaction of the ordered patterns of the sky with the most prominent local (Quimsachata) and regional (Ccapia) peaks. For Tiwanaku, the importance of these mountains was evident in their geological value (see table 8.1), as Ccapia was the source for andesite, and Quimsachata provided sandstone, the predominant materials in all monumental construction (Ponce Sanginés 2001; Vranich, Harmon, and Knutson 2005).

In a culture where there was no clear distinction between daily life and ritual, the ability to subsume and unify the ideologies of large groups of people through familiar visual symbols during periodic ritual ceremonies established common ground where economic, social, and political interaction could reach unprecedented heights.

NOTES

1. The formula to calculate the range of where an alignment can be seen is: $2 * (\tan(\Delta = x/d)$ (Δ is the margin of error, d is the distance from the foresight [mountain] to the backsight [archaeological site], and x is the distance in one perpendicular direction before exceeding the margin of error).
2. Bauer and Dearborn (1995, 105–7) identify Vega as the principal star in Urcochillay, the male llama constellations observed by the Inca.

Chapter 9

State of the Fish: Changing Patterns in Fish Exploitation and Consumption during Tiwanaku (AD 500–1100) in Iwawi, Bolivia

José M. Capriles

The Lake Titicaca Basin, located in the south-central Andes, was one of the most important centers of pre-Hispanic cultural development. In this region, between AD 400 and 1100, the Tiwanaku state developed. The emergence and consolidation of this important polity, as well as the social organization that characterized it, have been investigated from multiple diverse perspectives using a range of archaeological approaches (Albarracín-Jordán 1992, 1996a, 1996b, 2003; Alconini Mújica 1995; Bandy 2001; Bermann 1994, 1997; Browman 1978, 1981, 1984, 1997b; Giesso 2003; Goldstein 1993; Isbell, Burkholder, and Albarracín-Jordán 2002; Janusek 1999, 2001, 2002; Kolata 1992, 1993; Lémuz Aguirre 2001; Lynch 1983; McAndrews, Albarracín-Jordán, and Bermann 1997; Manzanilla 1992; Ponce Sanginés 1981; Rivera Casanovas 1994; Stanish 2001, 2003; Webster 1993). Many researchers have emphasized the importance of animal resources in the development of the Tiwanaku state, including the remarkable role of domesticated camelids (i.e., llama [*Lama glama*] and alpaca [*Vicugna pacos*]). For example, Browman (1978, 1981, 1997b) has proposed that the origin of the Tiwanaku state was based on the control and convergence of the traffic and exchange of goods among different ecological regions by means of llama caravans. Kolata (1992, 1993) has also underscored the complex domestic and ceremonial uses and meanings that the camelids had for Tiwanaku, as well as the complex socioeconomic organization that their specialized management might have entailed.

Unfortunately, only a few zooarchaeological studies have been conducted at Tiwanaku period sites. For instance, Webster (1993; Webster and Janusek 2003) presents empirical evidence for beginning to understand the role that camelids played in the Tiwanaku population's diet, as burden animals, and in the production of wool. Zooarchaeological analysis of Formative period (1500 BC–AD 500) sites such as Chiripa and Kala Uyuni, however, have underlined the diversity of faunal resources exploited by the populations that inhabited the region prior to Tiwanaku (e.g., Capriles, Moore, and Domic 2007; Capriles, Domic, and Moore 2008; deFrance 1997; J. Kent 1982; A. Kent, Webber, and Steadman 1999; Lémuz Aguirre 2001, 2002; Miller, Capriles, and Hastorf 2010; K. Moore 1999; K. Moore, Steadman, and deFrance 1999; Stanton 1994; Wing 1986).

These investigations have highlighted the relevance of other faunal resources such as fish, aquatic birds, and wild mammals in the subsistence economies of the Titicaca Basin inhabitants. Nevertheless, there are no detailed studies of the specific characteristics and variability of the exploitation and consumption of these resources during the Tiwanaku period. This is due to a number of factors, including biases in favor of the identification and analysis of camelid faunal remains and the underrepresentation of other species in screen samples. In this study, I address these issues by analyzing fish remains from a zooarchaeological perspective. I outline several characteristics of fish consumption and deposition in the Tiwanaku

rural settlement of Iwawi, the economic organization of fishing at this site, and the role fish might have played in Tiwanaku's state political economy.

THE SITE

Iwawi (LV 150) is located on the southeastern shore of Lake Titicaca, Bolivia, outlining a somewhat natural border between the northern end of the lower Tiwanaku valley and the southern breach of the Taraco Peninsula (fig. 9.1). The site was excavated in 1993 and 1996 by Proyecto Arqueológico Iwawi, codirected by William H. Isbell and Juan Albarracín-Jordán. The result of these investigations, along with the survey and limited excavations previously carried out by Albarracín-Jordán (1992, 1996a, 1996b), have allowed a preliminary interpretation of the site's pre-Hispanic occupational history (Albarracín-Jordán 1996b; Albarracín-Jordán and Isbell 1993; Burkholder 1997; Isbell et al. 1996, 1997; Isbell, Burkholder, and Albarracín-Jordán 2002).

The stratigraphy of Iwawi has been organized into eight successive levels of occupation that range between the Early Formative period (1500–800 BC) and the Late Intermediate period (AD 1100–1470). However, the densest human occupation dates to the Middle Horizon (AD 500–1100) (Isbell et al. 1996, 1997; Isbell, Burkholder, and Albarracín-Jordán 2002) (table 9.1). During the Tiwanaku IV phase (AD 500–800), the site was a relatively large rural settlement of 3.2 ha. Throughout the Tiwanaku V phase (AD 800–1100) it expanded to a secondary administrative center of approximately 4 ha, with more than 6 ha of associated raised fields (Albarracín-Jordán 1996b).

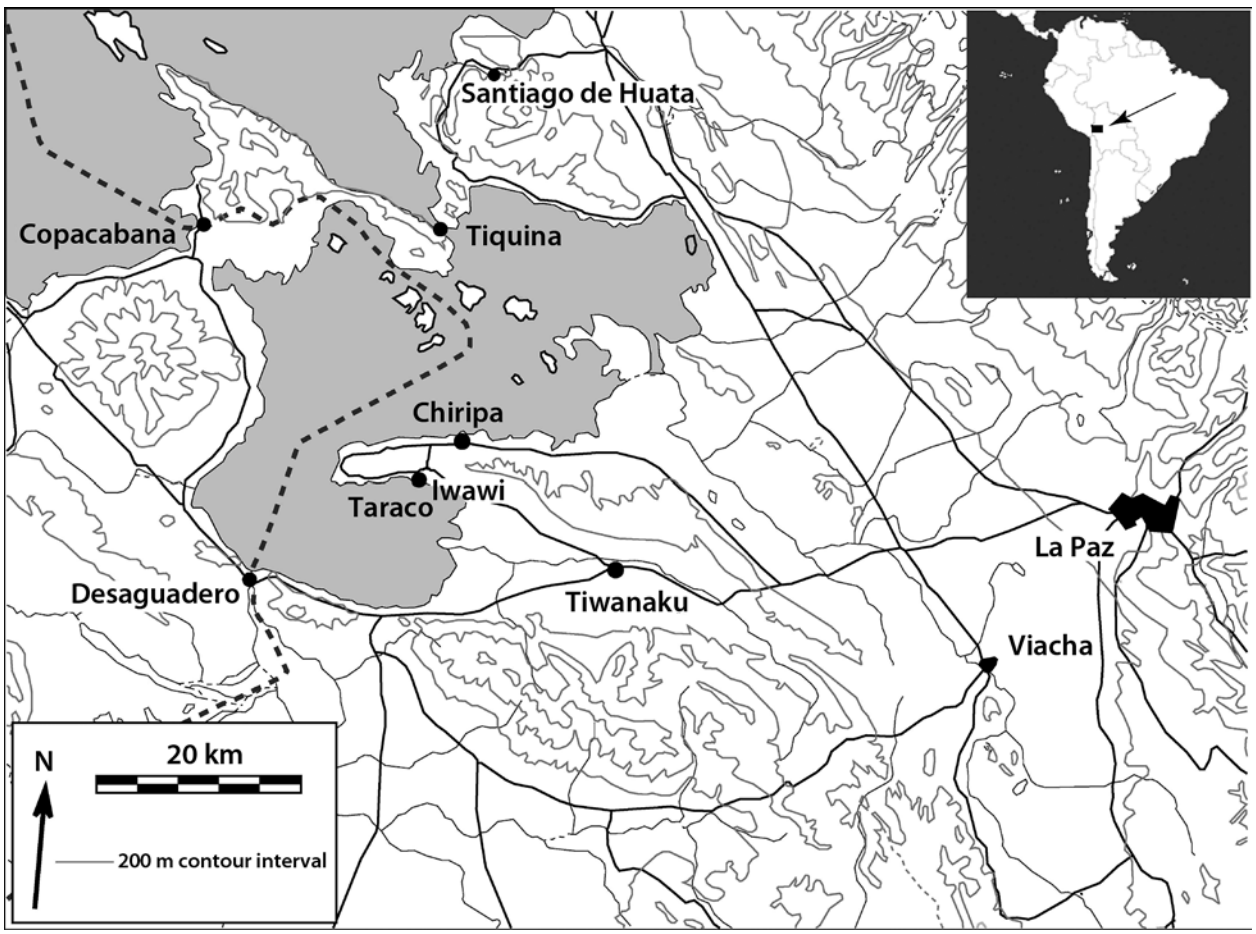


FIGURE 9.1 Map of the study area (*modified from Hastorf 1999, fig. 1*).

Table 9.1. Chronology of the site and region

Chronology	Period	Phase	Stratigraphy in Iwawi
AD 1532–1600	Early Colonial period	Late Pacajes	
AD 1470–1532	Late Horizon	Inka Pacajes	
AD 1100–1470	Late Intermediate period	Early Pacajes	?
AD 800–1100	Middle Horizon	Tiwanaku V	Levels 3A and 3B
AD 400–800		Tiwanaku IV	Level 4
AD 100–400	Late phase of Superior Formative period	Qeya	Level 5
200 BC–AD 100		Kalasasaya	Level 6
800–200 BC	Middle Formative period	Late Chiripa	Level 7
1000–800 BC	Early phase of Inferior Formative period	Middle Chiripa	Level 8
1500–1000 BC		Early Chiripa	?
2000–1500 BC	Terminal Archaic period	?	

SOURCE: Data following Albarracín-Jordán 1996b; Bandy 2001; Isbell et al. 2002.

The importance of Iwawi was initially noted by the presence of more than fifty andesite stone boulders, which suggested the site had served as a shoreline port (Ponce Sanginés and Mogrovejo Terrazas 1970). Thus, the traditional interpretation of the site was as the port used for the aquatic transportation of andesite stone blocks from the Copacabana Peninsula to the state's capital for the construction of public ceremonial architecture (e.g., Ponce Sanginés 1992). However, archaeological evidence found at Iwawi suggests that this settlement had a wider significance. Some of the other important above-surface remains include a canal that extends from the lake into the site, and an urban component, including a 3 m tall mound with a diameter of approximately 200 m, and a complex history of human occupation. Recent interpretations suggest Iwawi was an important regional settlement in the southern Titicaca Basin starting in the Formative period (Isbell, Burkholder, and Albarracín-Jordán 2002).

The investigations of Proyecto Arqueológico Iwawi focused on understanding Iwawi's long-term sequence of occupation, and included test excavations in a number of locations across the site and a large area of excavation in the northeast sector of the mound, called Queneqere. This sector of the site has been interpreted as a domestic area, and according to contextual evidence, specialized activities such as feasting and ritual burials also took place there.

METHODS AND ANALYSIS

I analyzed the faunal remains recovered from the 1996 excavations of Queneqere as part of my *Licenciatura* thesis (Capriles 2003; Capriles and Domic 2008). In this chapter, I present results from an analysis of fish remains from both the Tiwanaku IV (level 4) and V (levels 3A and 3B) phases (see table 9.1).

The Iwawi faunal remains were recovered using two complementary methods. Regular archaeological screening using 1/4 inch (6.35 mm) mesh resulted in the recovery of a representative sample of the macrofaunal remains, mostly composed of domesticated camelids. To obtain more representative samples of microfaunal remains, and especially of fish, flotation samples were also collected (Capriles, Moore, and Domic 2007). For each excavated locus, a 10 liter sample of sediment was obtained and floated using a modified SMAP machine, following the procedure for the Lake Titicaca Basin defined by Christine Hastorf (Hastorf and Bandy 1999).

In this study, I focus on the faunal remains from eleven loci. In addition to analyzing the bones recovered from the screen during excavation, I

sorted and analyzed the faunal material from the heavy fraction of the flotation samples. Following standard zooarchaeological criteria (Reitz and Wing 1999), I recorded the Number of Identified Specimens (NISP), the Minimum Number of Individuals (MNI), and weight (in grams) for the broad categories of macrofauna, fish, and other microfauna. Within each category, I documented species and skeletal part representations (by both NISP and by Minimum Number of Elements [MNE]); modifications such as cuts, gnawing, and working marks; and various stages of burning (e.g., Rick and Moore 1999). In the case of the fish remains, measurements were made using digital calipers.

I completed the faunal analysis in the Colección Boliviana de Fauna (CBF), using their comparative resources. In the case of the fish, however, I made an additional comparative reference collection that not only facilitated basic species identification but also permitted me to carry out an osteometric study.

The skeletal collection and subsequent measurement of contemporary specimens permitted me to: (1) establish values for a linear regression formula to determine the size of some archaeological specimens; (2) identify recovered faunal specimens up to the highest possible taxa, using information from the linear regression and other taxonomically meaningful morphological indicators; and (3) to infer from this data the range of fishing practices at Iwawi.

Lake Titicaca has only two native fish genera: *Orestias* (Cyprinodontiformes, Cyprinodontidae) and *Trichomycterus* (Siluriformes, Trichomyteridae). The killifishes (*Orestias*) have a great diversity of species, with at least twenty-three in Lake Titicaca, and are also widely distributed in a number of highland Andean lakes, from northern Peru to northern Chile. In contrast, there are only two catfish (*Trichomycterus*) species, *T. rivulatus* and *T. dispar*, distributed in numerous Andean rivers and the shores of Lake Titicaca (Lauzanne 1982, 1991; Parenti 1984; Villwock 1986).[1]

The importance of both *Orestias* and *Trichomycterus* genera have been recorded for Titicaca Basin archaeological sites by way of taxonomic identification (deFrance 1997; Lémuz Aguirre 2001, 2002; K. Moore, Steadman, and DeFrance 1999; Stanton 1994). For example, K. Moore, Steadman, and deFrance (1999) have demonstrated that during the Early Chiripa phase of the Early Formative period (1500–1000 BC), the most important faunal resources exploited in the Chiripa site (located roughly 5 km from Iwawi) were fish. Considering that the Chiripa investigations, among others, have demonstrated the potential importance of fish in the prehistoric Lake Titicaca region, one of the aims of the Iwawi zooarchaeological study was to explore their role during Tiwanaku times.

The osteometric study of the modern reference collection was aimed to evaluate the morphometric relationship between a number of measurements on the operculum bone (because of its archaeological conspicuousness) and the standard length of the specimens. The collection included thirty-eight individuals from the species *Orestias pentlandii* (N = 2), *O. albus* (N = 2), *O. agassii* (N = 13), and *O. luteus* (N = 21), selected on the basis of their size, distribution, and overall abundance in modern fish catches. The results of the study eventually allowed the definition of values for a linear regression equation: $y = a + bx$, where y corresponds to the standard length, a (47.30) is the slope, b (4.94) is the intersection of the slope, and x corresponds to the maximum anteroposterior distal length of the operculum.

Furthermore, although the reference collection did not include all *Orestias* species identified in Lake Titicaca, the relative morphometric variation between the standard length and the length of the head in the different species of *Orestias* (Parenti 1984, table 8), and the relatively low correlation coefficient of determination ($r^2 = 0.5$), meant that the linear regression should be used with caution, but bearing in mind that "phyletically related taxa should exhibit similar allometry" (Reitz et al. 1987, 313). The linear regression was used to estimate the standard length of the archaeological fish.

FISH CONSUMPTION IN IWAWI

Compared with macrofauna and other microfauna (small mammals, birds, and reptiles), fish remains constitute approximately 82 percent of the faunal remains by NISP, but only 6 percent by weight

(table 9.2). Moreover, as other studies have suggested, while macrofauna are adequately represented in screen fractions, fish remains are not. Extrapolating the flotation sample data to excavated volumes and then comparing them with the unchanged screen macrofaunal data suggests that fish remains constituted close to half of the consumed and discarded faunal remains by weight (Capriles 2003, table 7.2). Diachronically, there is a slight but insignificant decrease in fish importance between levels. Some of the strongest differences correspond to specific samples as opposed to the level from which they originated. For instance, a pit filled with ash (locus QE124/118) contained nearly double the number of fish remains from the densest midden sample. Interestingly, Stanton (1994), in a previous work carried out at Iwawi, notess a similar decrease through time in fish weight.

In order to assess the effective meat weight of these fish species, I carried out an allometric regression applying the equation provided by Reitz and coauthors (1987; Reitz and Wing 1999). The results presented in table 9.2 indicate an average of 32 percent (1.05 kg) of consumed and discarded biomass of fish for each analyzed locus. Thus, the macrofauna would have provided the 68 percent of the biomass (2.25 kg). However, an adjusted estimation of the macrofauna meat weight, following the formula proposed by Reed (cited in Reitz and Wing 1999, fig. 7.20), suggests an average macrofauna minimum meat weight of 1.89 kg, which would mean that the fish contributed an average of 36 percent.

Together, these results indicate the great importance of fish for the population's diet. Considering that, ethnographically, people in the study region today usually do not butcher their herds on a regular basis, but only in times of economic necessity and specific ritual events, it can be suggested that fish at Iwawi probably provided the meat basis of daily consumption.

Fishes Consumed at Iwawi

The genus *Trichomycterus* comprised a mere 0.16 percent of the total fish sample by NISP (N = 7), 7.57 percent of MNI (N = 5), and 1.25 percent (0.4 g) of the total weight.[2] Moreover, they were identified only in four loci, three of which were in level 3A, and the remaining one in level 3B,[3] all of them corresponding to Tiwanaku V. These percentages are consistent with data recorded by Lémuz Aguirre (2001, 2002) in sites from the Santiago de Huata Peninsula. The habitat of *Trichomycterus* is restricted mainly to the muddy deeps of the lake and in rivers (maisnly along the shores). Although their capture is not difficult, this genus is presently not intensively exploited (Levieil and Orlove 1990, 366) and may not have been in the past either.

The genus *Orestias* was the most commonly consumed fish at Iwawi. The taxonomic diversity of this genus comprises species adapted to almost every habitat present in Lake Titicaca and thus found almost at every depth and associated with a variety of ecosystems (Lauzanne 1991). The Iwawi samples contain a great number of skeletal remains corresponding to this genus, comprising 99.84 percent of the fish NISP (N = 4288), 92.43 percent of MNI (N = 59), and 98.75 percent (31.5 g) of the total weight, which also includes a small percentage of burned specimens (1.42 percent in

Table 9.2. Faunal identification from the studied flotation samples excavated in Iwawi

Cultural Level	Number of Loci	% Flotation Fish Weight	% Flotation Macrofauna Weight	% Fish Weight Lost in 1/4" Screen Sample Reconstructed	% Fish Biomass	% Macrofauna Biomass
3A	6	27.55	68.49	38.8	33.33	66.67
3B	3	27.46	65.69	25.62	22.94	77.06
4	2	13.76	79.09	44.39	38.74	61.27
Total	11	19.11	77.83	41.69	31.75	68.25

NISP [N = 61] and 3.81 percent in weight [1.2 g]). The characterization of the *Orestias* specimens is outlined below, following the results of the osteometric study.

The linear regression values derived from the reference collection allowed the determination of the standard length of some specimens of the Iwawi collection and an approximation of the species fished by the inhabitants of this site. A total of twenty-eight operculae were sufficiently preserved to permit measurements of their anteroposterior distal length (fig. 9.2; table 9.3). These specimens came both from flotation samples and their corresponding screened samples. The determination of the standard length of the specimens shows a distribution range from approximately 109 to 138 mm. Although a slight size reduction through time is observed, this trend is not statistically significant (one-way ANOVA d.f. = 27, F = 0.647, *P* = 0.532).

The osteometric analysis presented can also be applied to 1/4 inch (6.35 mm) samples. Given that most of the operculae are larger than the screen gap (at least those that can be measured), this technique can be potentially applied to the screen fraction. With this in mind, a test was applied to one locus, QE307, where the cultural context was well defined (level 4 midden) and where a considerable quantity of operculae was recovered at the screen (no flotation sample was available). The resulting pattern is very similar to the one described in the eleven previously measured samples (table 9.4; fig. 9.3). The derived standard lengths ranged from 110 to 148 mm (range 38 mm, median 131.49 mm, N = 76). The average observed in locus QE307 also supports the observed decreasing trend between levels (table 9.3). Interestingly enough, no statistical differences were observed between right and left operculae (one-way ANOVA, d.f. = 75, F = 659, *P* = 0.42).

Comparing these results with the standard lengths of known species of Lake Titicaca (Parenti 1984), we find a number of overlaps between the calculated standard lengths of the archaeological specimens and the size ranges of the mature individuals of the species *O. pentlandii*, *O. albus*, *O. farfani*, *O. luteus*, *O. tschudii*, *O. frontosus*, *O. rotundipinnis*, *O. puni*, *O. agassii* and the sub-adult individuals of *O. cuvieri*—the biggest *Orestias* species (see table 9.5). Interestingly, these are the largest species of the genus.

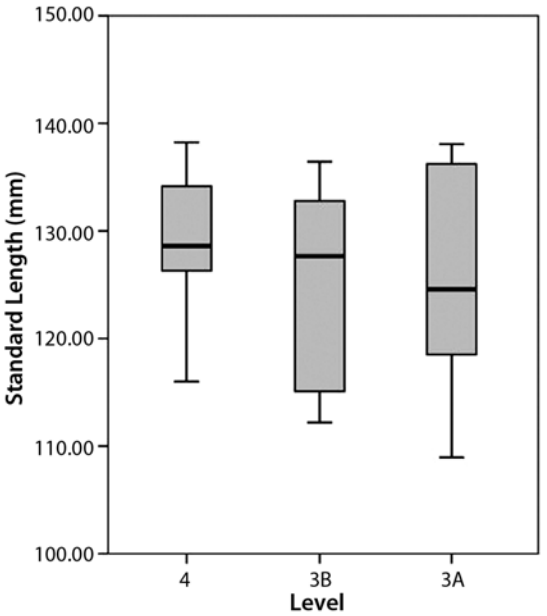


FIGURE 9.2 Box plots of derived standard lengths of measured operculae from the archaeological samples by level (see table 9.3).

Additional morphological characters recognizable in the archaeofaunal collection confirm the presence of a number of species. The probable presence of *O. cuvieri*, *O. pentlandii*, *O. luteus*, *O. rotundipinnis*, *O. farfani*, *O. albus*, and *O. olivaceus* in the samples is suggested by the finding of large, recurved unicuspid outer jaw teeth for the two former species and thick, rough scales covered with dense granulations for the five latter species (Parenti 1984).

The application of linear regression to the archaeological specimens permits the definition of an archaeological signature (*sensu* Lyman 1994; Stahl 1996) and a derived distribution limit. In this case, the archaeological signature is that the presence of *Orestias* cranial bones (and particularly operculae) in the archaeological record is directly proportional to the standard length of the specimen. In the case of *Orestias*, the distribution limit seems to be 10 cm for the standard length. In other words, if the operculae of this genus is measured, the minimum standard length of the specimens to which these skeletal bones belonged must be 10 cm. Therefore we predict that specimens with a standard length of less than 10 cm

Table 9.3. Characteristics of the operculae measured and their derived standard length from Iwawi

Level	North	East	Locus	Provenience	NISP	NISP of Operculae	Side	Anteroposterior Distal Length of the Operculum (mm)	Standard Length (mm)
3A	534	508	18	Flot	653	5	L	12.48	108.92
3A	532	510	106	1/4"	19	15	L	14.42	118.50
3A	534	510	124/118	Flot	1252	6	R	14.79	120.32
3A	532	510	106	1/4"	19	15	L	16.51	128.82
3A	530	510	104	1/4"	4	4	L	18.01	136.22
3A	538	506	15	1/4"	34	9	L	18.38	138.05
3B	534	510	144	1/4"	54	26	R	13.14	112.18
3B	534	510	144	1/4"	54	26	L	13.20	112.47
3B	534	510	144	1/4"	54	26	L	13.66	114.75
3B	534	510	144	1/4"	54	26	L	13.8	115.44
3B	534	510	144	1/4"	54	26	L	14.89	120.82
3B	534	510	144	1/4"	54	26	R	16.07	126.64
3B	540	506	143	1/4"	1	1	L	16.48	128.67
3B	534	510	144	1/4"	54	26	R	16.51	128.82
3B	532	508	59	1/4"	16	10	R	17.24	132.42
3B	534	510	144	1/4"	54	26	R	17.39	133.16
3B	534	510	144	1/4"	54	26	L	17.75	134.94
3B	534	510	144	1/4"	54	26	R	18.05	136.42
4	530	506	49	1/4"	55	15	L	13.91	115.98
4	530	506	49	1/4"	55	15	R	14.86	120.67
4	530	506	49	1/4"	55	15	R	16	126.30
4	530	506	49	1/4"	55	15	R	16.18	127.19
4	530	506	49	1/4"	55	15	L	16.45	128.52
4	530	506	49	1/4"	55	15	L	16.48	128.67
4	530	506	571/572	1/4"	15	4	L	17.02	131.33
4	530	506	49	1/4"	55	15	R	17.59	134.15
4	530	506	571/572	1/4"	15	4	L	18.26	137.46
4	530	506	49	1/4"	55	15	L	18.42	138.25
								Median 3A (N = 6)	125.14
								Median 3B (N = 12)	124.73
								Median 4 (N = 10)	128.85
								Total median (N = 28)	126.29

will not be visible in the archaeological record. This may be explained by predepositional (e.g., net sizes, cooking, mastication, digestion, disposal, etc.) and postdepositional (e.g., fragmentation, erosion, trampling, archaeological recovery techniques, etc.) taphonomic factors.

Table 9.4. Derived standard length of the measured operculae from locus QE307 (N530E506, level 4)

Side	Anteroposterior Distal Length of the Operculum (mm)	Standard Length (mm)	Side	Anteroposterior Distal Length of the Operculum (mm)	Standard Length (mm)
L	12.73	110.15	L	17.22	132.32
L	13.42	113.56	L	17.23	132.37
R	14.50	118.89	L	17.24	132.42
R	14.75	120.13	L	17.24	132.42
R	14.86	120.67	R	17.25	132.47
L	14.92	120.97	R	17.26	132.52
L	15.28	122.74	L	17.31	132.77
R	15.34	123.04	R	17.32	132.82
R	15.47	123.68	R	17.33	132.87
R	15.53	123.98	L	17.37	133.06
L	15.64	124.52	R	17.37	133.06
L	15.70	124.82	L	17.38	133.11
R	15.76	125.11	L	17.54	133.90
L	15.89	125.76	R	17.57	134.05
L	16.10	126.79	L	17.58	134.10
L	16.12	126.89	R	17.69	134.64
R	16.17	127.14	R	17.71	134.74
L	16.30	127.78	L	17.74	134.89
L	16.34	127.98	L	17.80	135.19
R	16.44	128.47	R	17.80	135.19
L	16.58	129.16	R	17.85	135.43
L	16.65	129.51	L	18.00	136.17
R	16.74	129.95	R	18.03	136.32
R	16.74	129.95	L	18.07	136.52
R	16.78	130.15	R	18.1	136.67
R	16.78	130.15	R	18.21	137.21
L	16.80	130.25	R	18.22	137.26
L	16.87	130.59	L	18.29	137.60
L	16.94	130.94	L	18.30	137.65
R	16.95	130.99	R	18.46	138.44
L	16.96	131.04	L	18.47	138.49
L	16.99	131.19	L	18.63	139.28
R	17.01	131.29	L	18.93	140.76
L	17.02	131.33	R	19.26	142.39
R	17.02	131.33	R	19.28	142.49
R	17.1	131.73	R	19.48	143.48
L	17.11	131.78	L	19.61	144.12
R	17.12	131.83	R	20.42	148.12
				Median (N = 76)	131.49

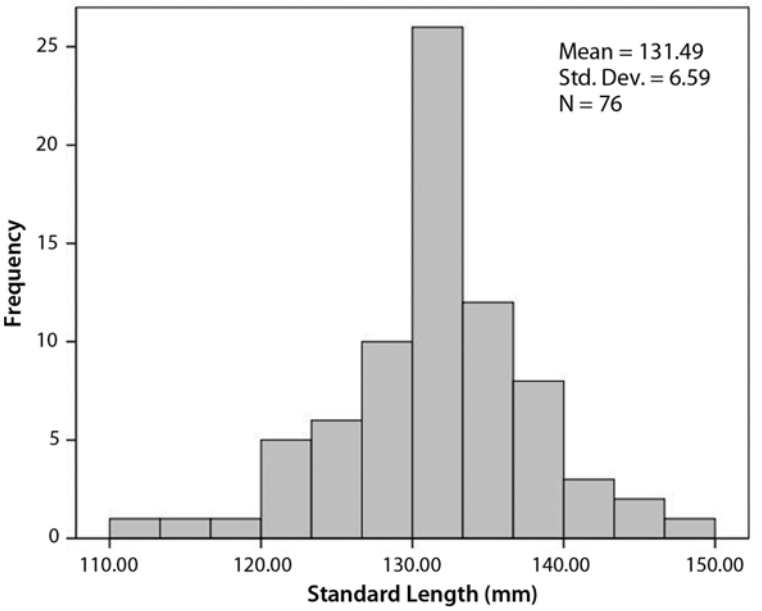


Figure 9.3 Frequency distribution of the derived standard length of the measured operculae from locus QE307 (N530E506, level 4); NISP = 416, total operculae NISP = 201, measured operculae NISP = 76 (see table 9.4).

Table 9.5. Standard length of the largest *Orestias* species described for Lake Titicaca

Adult Range (mm)	Holotype (mm)	Sexual Maturity (mm)	Species
170–220	175	170	*O. cuvieri*
125–200	163	125	*O. pentlandii*
100–142.4	132	100	*O. albus*
106–115	106	106	*O. farfani*
91–150	126	75–82	*O. luteus*
88–145	118–129	88	*O. tschudii*
86–155	141–155	86	*O. frontosus*
85–115	109	85	*O. rotundipinnis*
80–124	117–124	80	*O. puni*
60–126	77–79	60	*O. agassii*
56–92	67–92	56	*O. mulleri*
65–65.7	65	65	*O. crawfordi*
56–84	73	60	*O. forgeti*
55–76.5	62	55	*O. ispi*
45–85.5	60	45	*O. olivaceus*

Note: NISP = 416, total operculae NISP = 201, measured operculae NISP = 76

Predepositionally, it is possible that specimens less than 10 cm long were small enough to be consumed whole and thus were broken down by the human digestive system. For example, it has been documented ethnographically that the species *O. ispi* (adult standard length ranges from 55 to 76.5 mm) is consumed in its entirety (including its head). On the other hand, it is also possible that operculae belonging to specimens with a standard length of less than 10 cm could be recovered archaeologically, but because of a series of destructive taphonomical processes, their identification would be difficult. The possibility that small specimens were not fished because of cultural choices, perhaps based on cost-benefit energy investment in fishing, should also be considered (although for the case of *O. ispi* this is unlikely, as their capture is facilitated by their aggregation in schools). Finally, it seems that, biologically, a division among small species and relatively large species also exists in the *Orestias* genus.

DISCUSSION: FISHING STRATEGIES AND TECHNOLOGY AT IWAWI

Interpretations about fishing practices and their sustainability at Iwawi during Tiwanaku times can be suggested from the produced data. Fishing was probably carried out with net technology. At Iwawi and several other archaeological sites of the Lake Titicaca Basin, the presence of numerous bone tools, such as awls and net gauges, strongly indicates the use of this technology (K. Moore 1999). The absence of other devices, such as fishhooks

and spears (at least from perishable materials), suggests the nonexistence or infrequent nature of this practice. Fishhook and spear fishing are rarely used today at Lake Titicaca, since the small sizes of native species make these practices economically unfeasible.

Net fishing is the most common practice recorded ethnographically (*sensu* Levieil and Orlove 1990; Orlove, Levieil, and Treviño 1991; Vellard 1991). Today, one of the most common types of fishing is with demersal (but also pelagic) gill nets for the capture of native species at depths from about 3 to 30 m. In this type of fishery, nets (with mesh diameters between 38 and 63 mm) are kept vertically in the water by way of stone net weights or sinkers, floats, and the support of totora or wooden rafts. Another common practice is trawl fishing, whereby two parallel boats simultaneously trawl and capture schools of *O. ispi* and *O. agassii*. The third type of fishing, which can even be carried out by children, consists of sweeping beaches with small nets to capture tiny fish. Finally, there are a number of practices, which rely upon a complex set of artifacts, including various handcrafted nets that are used in the macrophytes or totora facie near the shore in relatively shallow waters (1–3 m below the surface).

These fishing methods do not require a complex social organization; on the contrary, they require low energy investment costs and thus can be accomplished by individual members of a nuclear family. Nevertheless, such practices are facilitated by corporative communal organization and cooperative participation by members of a group or community. Such larger political organizations alleviate environmental risks and related socio - political problems (e.g., net thieves, fishing intruders, and territorial conflicts) (Levieil and Orlove 1990; Orlove, Levieil, and Treviño 1991).

The ecology of these fishes also sheds light on where people may have been fishing in the past. At Iwawi, the presence of *O. luteus*, confirmed by the presence of rough scales, suggests that much of the fishing was practiced in the totora facie (1–3 m below the surface) and the chara facie (3–10 m below the surface) (*sensu* Lauzanne 1991, 415–16, fig. 3). These are the widest areas near Iwawi, and the residents of this settlement could have readily practiced net fishing in these ecosystems.

The presence of considerably larger specimens in the archaeological record suggests that fishing also took place in areas farther away from the site. For example, the preferred habitat of species like *O. cuvieri* and *O. pentlandii* are in the deeper levels of the peripheral facie (10–60 m below the surface) and the central facie (60–284 m below the surface) (Jaime Sarmiento, personal communication, 2003). If fishing of schools of *O. ispi* (which live in these same areas) was practiced (which is a likely scenario, considering the need to intensify available meat resources as the site and its associated settlement system grew), the fishing practices would have had to include strategies and technology to incorporate fishing in deeper sectors. Considering the intense aquatic traffic that occurred at the site for the transport of andesite, navigation specialization might have developed along with other types of activities, such as offshore fishing. Therefore, Iwawi might have played an important role not only in the provision of andesite raw material but also in the procurement of fish and other aquatic resources for the capital and the inland valley settlements of Tiwanaku.

Furthermore, the provisioning of fish may have been carried out both through fishing in deeper sectors of the lake as well as through exchange networks with other specialized fisherfolk. In both cases, the species captured at deeper levels could be of greater relative value (e.g., *O. cuvieri*) than the species commonly captured near the shores (e.g., *O. luteus*).

It is possible to consider the presence of certain species of fish not only as staple goods for consumption but also as prestige commodities. Lémuz Aguirre (2001), for instance, has suggested that the scarcity of *Trichomycterus* in the archaeofaunal collections of Santiago de Huata could be attributable to the symbolic importance of this fish, indicated by its numerous iconographic representations dating to the Formative period. Tiwanaku iconography also contains many zoomorphological depictions, including representations of both *Trichomycterus* and *Orestias* genera. The fact that this iconography is even more conspicuous than in previous periods (on such stone sculptures as the Gateway of the Moon, the Mamacocha monolith, and the Llojeta lintel,

among others) may perhaps be attributable to the importance of this resource for the population's diet, to the differential value attributed to certain species, or even the emblematic identity linking certain social groups with determinate species. This linkage could have very well originated in the specialized labor identity of their beholders (*sensu* Janusek 1999, 2002). This would reinforce a socioeconomic context where labor specialization was framed in a system of segmented but nested social hierarchies (Albarracín-Jordán 1996b, 2003; Kolata 1992, 1993). Moreover, it is also compatible with the increasing prestige and redistribution political economy promoted by the emerging Tiwanaku elites (Stanish 2001, 2003).

CONCLUSIONS

Iwawi was an important Tiwanaku regional administrative center located on the shores of Lake Titicaca at the mouth of the Tiwanaku valley (Albarracín-Jordán 1996b). The presence of andesite blocks at the site suggests an important link between the western shore of the southern Titicaca Basin and the procurement and transportation of fine, raw architectural materials. This study shows, in addition, that Iwawi may have also played an important role in the procurement of another resource: fish. Comprising about 32 percent of the biomass consumed and discarded at the site, fish was probably an essential component of the local staple diet. Through time, a slight decrease in their overall abundance parallels the small decrease in their size, suggesting a more intensive exploitation. Although the growth of the settlement and its associated population may have caused a more intensive extraction strategy, it is just as likely that the site provided an important volume of fish to the state capital.

Fishing intensification probably occurred parallel to the intensification of the production of other resources, such as raised field agriculture and camelid herding (Kolata 1993). The presence of intensified fishing practices is in accordance with similar processes entailed in the economy of production and distribution of staple and prestige goods (Browman 1981, 1997b; Kolata 1993; Núñez and Dillehay 1995). It is probable that the intensification of popular current fishing strategies (e.g., demersal gill-net and trawl fishery) may have occurred during this time.[4] Moreover, it was in the realm of market demand, property rights, and technological investment that the actions and authority of the state were most evident.

Based on the patterns of fish remains at Iwawi and recent research that demonstrates that various other subsistence resources of the Formative period were increasingly manipulated by the Tiwanaku state, I propose several possible explanations regarding the effect the state had on Iwawi fishing practices.

First, I suggest there was a standardization of fishing practices. The standardization could be defined by the procurement of the same fish species and of similar sizes. This study demonstrated a standard set of taxa and size of fish were exploited in Tiwanaku times at Iwawi. Of these fish , *Orestias* were clearly preferred over *Trichomycterus*, and even some *Orestias* species were preferred over others (e.g., *O. luteus*). When the Tiwanaku state emerged, a series of standardized fishing procedures were already in place, particularly gill-net fishing. Moreover, it is probable that customary net diameters were already defined and reproduced from generation to generation through cultural mechanisms. This is observable in indicators such as the size (especially the width) of the nets gauges so ubiquitous in the archaeological record (K. Moore 1999), but also in the small range observed in the standard length of the fishes as reported in this study (table 9.3).

Second, a possible overexploitation of the available fish resources took place. This pattern could be interpreted as a consequence of more intensive fishing practices. The trend of decreasing fish size at Iwawi correlates with the growth of the settlement. This suggests that the fish caught were gradually of lesser age than previous catches and/or a reduction in the fishing net size. In both cases, this indirect evidence suggests that an overexploitation took place during Tiwanaku times. Additionally, it would confirm a territoriality model (see Levieil and Orlove 1990), because a reduction in fish size would take place after consistent fishing in a circumscribed location. Moreover, it should also be considered that as the site participated in broader exchange networks, larger fish would likely be exchanged and moved to

other locations, while smaller fish would have been left for local domestic consumption, which is the pattern observed in the middens and trash pits of Iwawi.

At the moment, the above discussion remains hypothetical; further research is required to better understand this process (see Capriles, Domic, and Moore 2008). The available data suggests, however, that at Iwawi the traditional wild resource subsistence economy of fish was progressively transformed by the state to an economy of staple and prestige goods extraction. The basis of this economy was in traditional fishing strategies, but the state may have induced more intensified and less sustainable practices. In this sense, the disintegration of the Tiwanaku state should be reconsidered by taking into account not only outside influences, such as climatic change (Kolata 1993; Ortloff and Kolata 1993), but also the impact the state had on its own environment (Erickson 2000) as well as the long-term impact and development of the local population's resource use strategies.

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NOTES

1. During the last century the *Orestias* genus has been severely threatened due to intense processes of human exploitation, predation by introduced species, and habitat destruction. This has caused a dramatic reduction in their abundance and even the extinction of at least one species (Sarmiento and Barrera 2003).
2. Because in this study scales were included in the NISP counts and *Trichomycterus* do not have scales, the NISP has a strong bias in favor of the *Orestias* genus.
3. No *Trichomycterus* specimens were recovered in the screened samples.
4. It is important to note that fishery practices in Lake Titicaca can be carried out during the entirety of the year, since the climatic variation produced during the wet and dry seasons (Roche et al. 1992) are not significant enough to cause major changes in fishing practices, although they might have some effects in the reproductive behavior of the fish.

Chapter 10

The Tiwanaku of A. F. Bandelier

Nicholas Bentley

In 1894, Adolph Francis Bandelier, already a prominent anthropologist known for his work in the American Southwest, embarked on a trip to Bolivia and Peru that included a stop of three weeks at the site of Tiwanaku (August 30–September 17). While the article that resulted from this trip, "The Ruins of Tiahuanaco" (Bandelier 1911), is primarily a work of anthropology and ethnohistory, the notes he compiled during this trip are a rich archaeological record. Denied permission to excavate, Bandelier instead surveyed the site, providing a detailed and accurate description of all the monuments visible at the time. In the end, he decided not to continue his work at Tiwanaku and instead conducted research on the Island of the Sun, leaving invaluable publications, descriptions, maps, and photographs that would be revalued by later archaeologists (Bauer and Stanish 2001).

Bandelier's notes are stored in the archives at the Museum of New Mexico Library in Santa Fe; the Southwest Museum in Los Angeles has thirty-three photographs taken by Charles Lummis, who had accompanied Bandelier (Donnan 1973). Bandelier later converted his notes and measurements into three beautiful watercolor maps that remain in safe storage at the American Museum of Natural History in New York. But while these watercolor maps are both accurate and aesthetically pleasing, they are only a condensed version of all the information from field drawings and measurements and contain very little accompanying text. A full analysis of the fieldnotes provided an opportunity to contextualize the watercolor maps with Bandelier's thoughts and observations. Since many of the existing stones on the site were removed in order to build bridges and trestles for the railroad tracks for the La Paz–Guaqui railroad, Bandelier's records are an invaluable view of the layout of the site before it was forever altered by modern construction.

Methodology

The process of transcribing the fieldnotes of Bandelier's 1894 trip to Tiwanaku was first undertaken during the 2004 field season. While in the field, roughly eighty pages of typed and handwritten notes photocopied from the archives of the Museum of New Mexico Library were transcribed. The notes themselves are a blend of site descriptions, notes on the Aymara people, and general travelogue. Most pertinent to this study were sketches and descriptions of the ruins.

First, Bandelier's original drawings, scanned and stored as digital images, were oriented north so that all the maps could have a common orientation that was lacking in the field journals. These scans were then transferred and vectorized (traced by hand into line drawings) for clarity. Programs such as Adobe Illustrator allowed the transcriber to pull apart crowded fieldnotes into separate layers, such as topography, excavations (looters' holes, in fact), architecture, and text. Once vectorized, the underlying drawing could be turned off and the appropriate layer left visi-

ble. The vectorized maps were compared to the appearance of the site at present, and any changes were noted while in the field. Any significant removals, additions, or alterations of monuments on the maps were then incorporated into a final layer on the vectorized maps called "present site."

Because of the limited size of the pages of his fieldnotes, none of Bandelier's maps were drawn to scale. Although he never explicitly mentions his survey methods in the fieldnotes, the notes contained in each map give a good idea of how he conducted the survey. Nearby architectural features were generally assumed to lie in a straight line. For objects that were farther away, Bandelier would site a feature in the distance to use as a guidepost. Then, using either a tape measure or regular paces, he would calculate the distance between the two features. Since the maps themselves are confined to single pages in his fieldnotes, he devised a cross-referencing system that would allow him to refer to single stones in multiple maps. Generally, these were done by assigning a letter to the guidepost stones, then referring to the page on which they first appeared when using them in later maps. For example, the first map of the Kalasasaya (map 11) has the four corner stones labeled as A, B, C, and F. Not only are these referred to again in the second map of the Kalasasaya (map 13), but stone B is used as a reference point to the southwest when Bandelier describes the stones found to the northeast in map 18.

BANDELIER'S MAPS

Three maps are in the archives of the American Museum of Natural History: a full view of the site, from the Pumapunku (lower left corner) to the monuments around the Akapana (upper right corner) (fig. 10.1); a close-up view of the Kala - sasaya and the Putuni complex (fig. 10.2); and a series of vignettes detailing interesting architecture and the dimensions and contents of looters' holes (fig. 10.3). Although the full-view map has suffered some minor damage, no details have been lost. The other two maps are in perfect condition.

The full-view map covers a 2 by 2 km area. The basic dimensions and spatial relations of the monuments are accurate. In the bottom right is the key, with small views of the topography of the eroding platforms of the Pumapunku, Kalasasaya, and Akapana. Bandelier includes a note that the sizes of certain loose stones and smaller walls have been exaggerated to make them visible. The individual stones of the revetments of the Kalasasaya and the Putuni are clearly visible in the close-up view, but the surrounding smaller walls and loose stones have for the most part not been included. All architecture detailed in the vignettes is recognizable on the site, minus missing blocks here and there, but the fieldnotes were essential to relocate the open looters' trenches, where Bandelier draws both the plan and elevation of what he considers the foundations of residences.

BANDELIER'S FIELDNOTE SKETCHES

Kalasasaya – Maps 11, 13

The Kalasasaya seemed to interest Bandelier the most, as it was the first monument that he sought to map out in detail, and the maps occupy several pages of the field journal. However, part of this might be due to the fact that the Kalasasaya investigation was frequently interrupted by bouts of illness. The fieldnotes give some indication of his physical state: "Went out to the ruins at 11 AM, but could not stand it longer than 1 PM. Lack of breath caused by nausea, pain in bowels, and general weakness, compelled us to give up the work + to return home" (fieldnotes, 12).

The Kalasasaya is depicted on two separate maps in Bandelier's notes: one with a full depiction of the gateways and monoliths on the site, and another with a strict focus on the stone pillars. The first (map 11) shows a depiction of the Kalasasaya that bears a significant resemblance to its modern-day version. The Gateway of the Sun is in its present location at the northwest corner of the Kalasasaya, which, as Bandelier notes, is "inside of the enclosure and not in a line with the pillars." The Fraile Stela is also where it is presently located (southwest corner of the Kalasasaya), and the ten pillars that mark the western wall have changed little beyond setting one of them upright again. Bandelier notes an indentation in the ground where the Ponce Monolith would be excavated by Fortuna Ponce half a

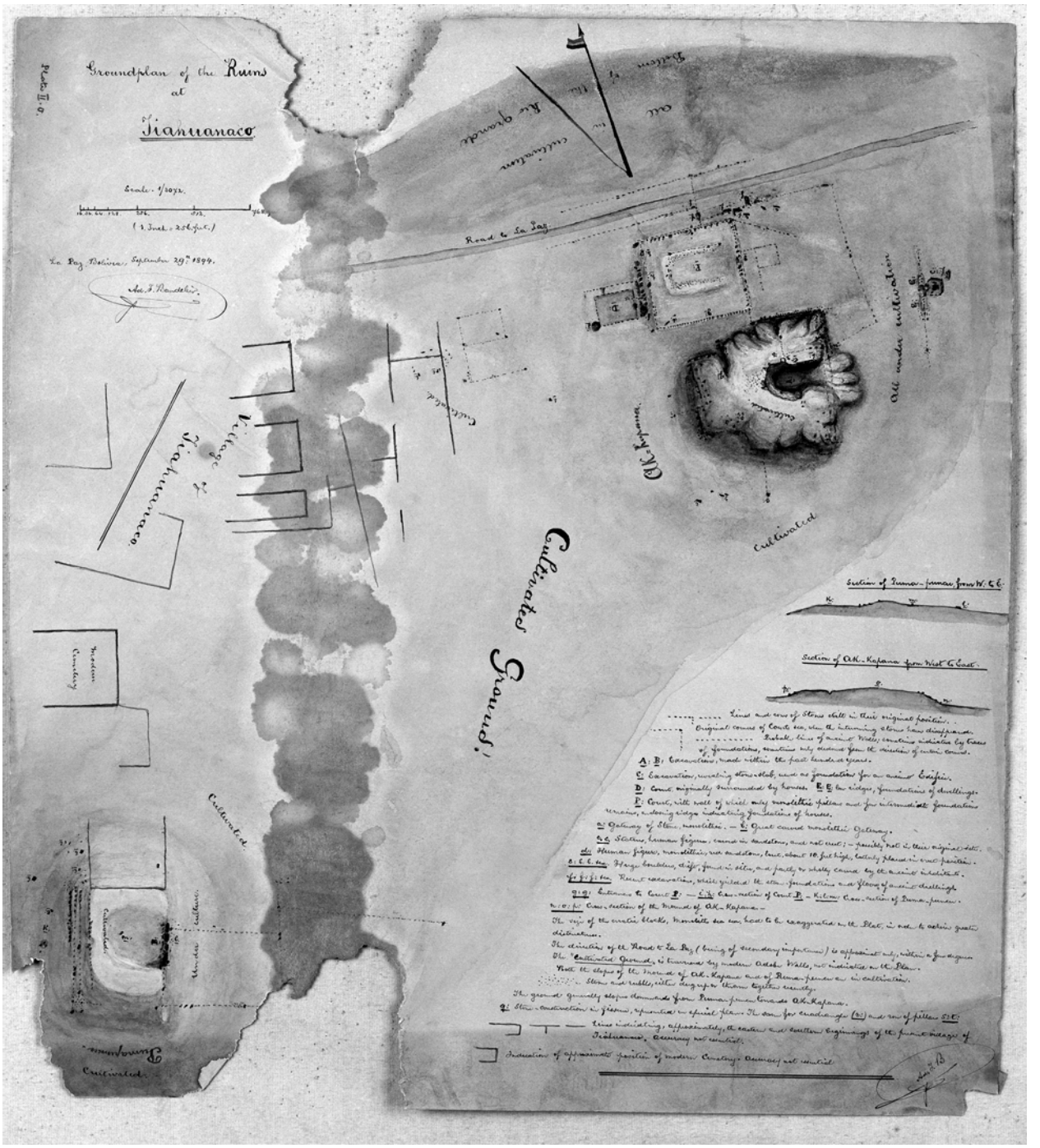

FIGURE 10.1 Full-view map of Tiwanaku.

century later and, critical for later archaeoastronomical studies (Benítez 2009), three larger flat slabs in the center of the platform and a long north-south rise.

The map of the Kalasasaya stones (map 13) provides some additional insights. With the exception of one stone near the western side of the northern wall, all the pillars documented by Bandelier remain there today and have been incorporated into the temple's reconstruction. The stone, now marked P111, appears to have broken near its base, and the remaining portion has been laid nearby. Whether this stone was broken during the reconstruction or earlier is unknown.

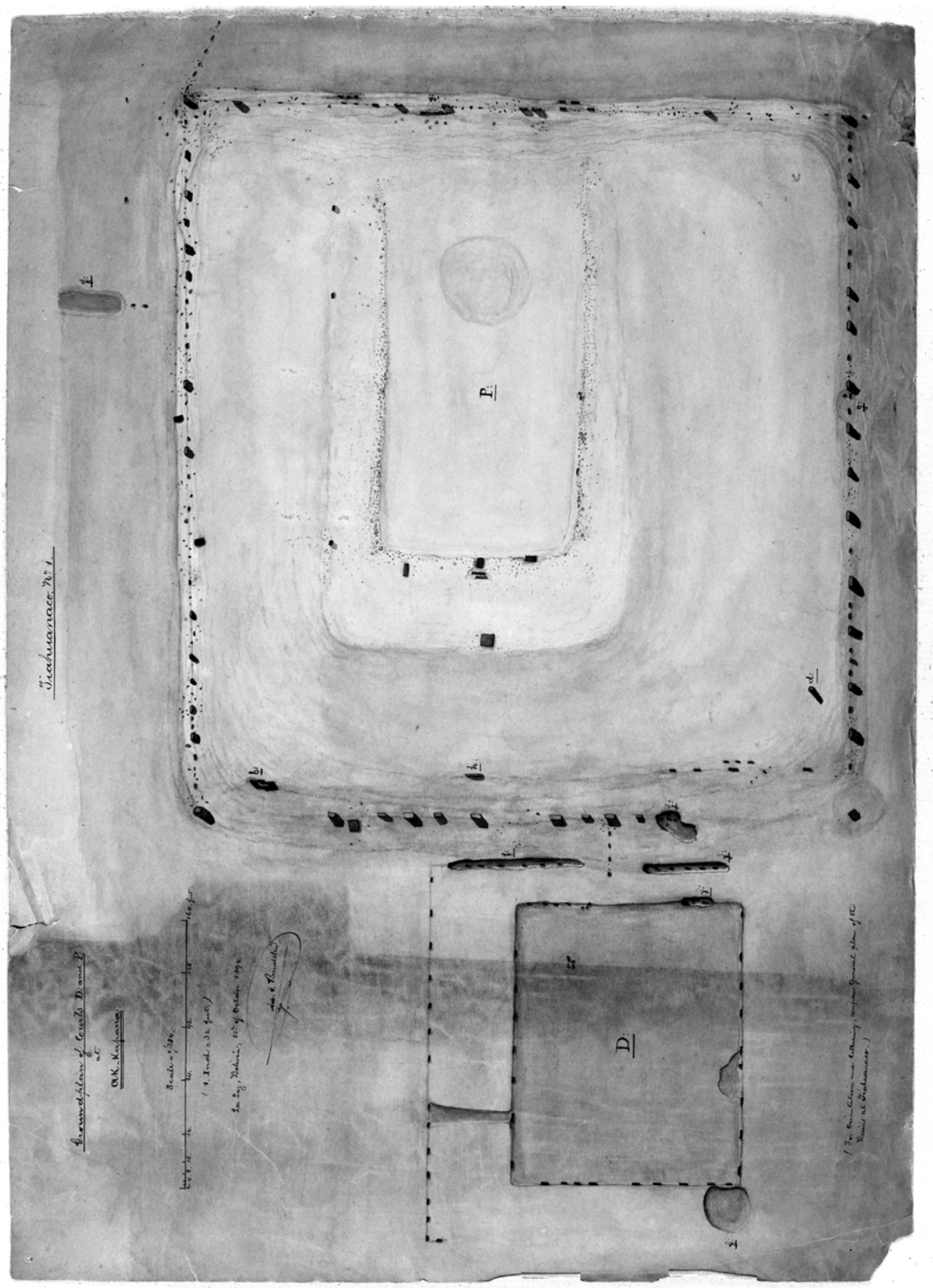

FIGURE 10.2 Close-up view of the Kalasasaya and Putuni complex.

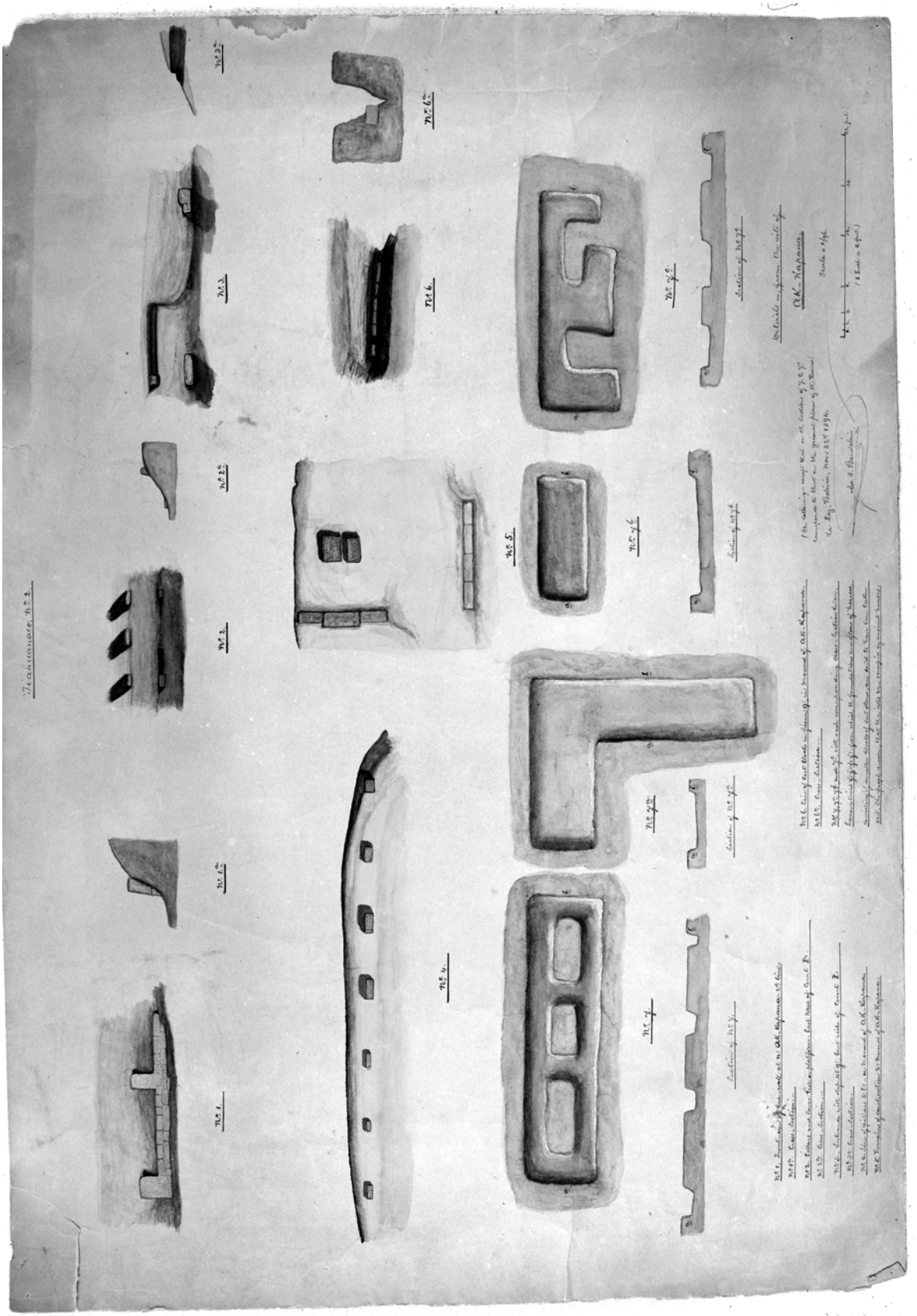

FIGURE 10.3 Architectural details, and dimensions and contents of looters' holes.

Bandelier describes a point of access at the present location of the heavily reconstructed gateway on the Kalasasaya's eastern wall but also indicates that the location on the southern wall between the pillars that are labeled as P15 and P16 today is also "manifestly" an entrance. From the original excavations, photographs, and notes taken by Cordero Miranda, it does not appear that this "entrance" was a pre-Columbian construction.

Akapana – Maps 15, 16, 17, 19

Bandelier's fieldnotes include two detailed illustrations of the Akapana, one of the monument itself, and another of the Akapana in its larger context. Additionally, there are several detailed drawings of the Akapana's west side. The two overview maps, as well as the detail map on page 16, indicate that the slopes of the Akapana were covered with large carved blocks on all sides at the time of Bandelier's visit. With a few exceptions, all of these blocks have since been removed. Some of these, identified as pieces of a large gateway (Protzen and Nair 2013), have been relocated to the summit of the pyramid and fitted; the rest were most likely victims of the construction of the railroad.

A series of sketches on page 17 also provides details of several features located at the summit of the Akapana. One is a detailed sketch of the row of pillars that stands on the northern extension of the summit. While there are currently six pillars in this location, Bandelier's map clearly indicates that there was once a seventh pillar to the west, standing in line with the others. Since the pillar was located near the slope toward the center, it is likely that it fell and was subsequently removed. Another detail sketch is given of the small enclosure on the northern end of the Akapana. While a few exposed blocks were visible in Bandelier's time, the area has since been excavated to reveal three sides of a structure of unknown purpose (Manzanilla 1992). This structure has a complement on the south side, and some have suggested that these are the paltry remains of the edges of a sunken court (Escalante Moscoso 1994).

Of additional significance are some of the nearby features that have since been removed. Map 16 shows several features that are located significantly south of the Akapana. These include one large stone slab that remains there today, along with another large slab and two fallen statues that have since been relocated. Additionally, map 19 indicates that a gateway, most likely the so-called Puerta de Estrellas, was also located within roughly 91 m of these other monuments before it was removed and placed in the Museo Lítico de Tiwa - naku. The fact that all these significant stones were found in close proximity to each other raises the possibility that they were close to their in situ positions at the time of Bandelier's visit. If true, further geophysical investigation of this area may be warranted to see if these exposed monuments correspond to any subsurface architecture.

Map 16 also contains some worthwhile notes on the terrain and sheds some light on a problematic claim on the design of the site. Some scholars have proposed that a large moat extended around the entire core (Posnansky 1912, 1945; Kolata 1993). The ditch to the east of the Akapana is the most visible remnant of this; according to the proponents of the "moat," the southern extension would have been filled in during the construction of the railroad. Bandelier does not make a detailed topographic map, as Arthur Posnansky would several decades later, but he notes areas that slope up or down and makes accurate cross sections of looters' trenches and profiles of the platforms. Although constantly complaining of a shortness of breath, he makes the effort to walk to a point far and high above the site to notice the form and the sloping boundaries of the "promontory" upon which the site is located. In his survey of the area south of the Akapana, which extends over 30 m beyond the present-day fence and railroad, Bandelier notes that the ground is level and cultivated and marks it as such in his final map. Photographs taken by Max Uhle the same year also show a completely flat ground. It would seem, then, that the "moat" is the product of modern construction of the terreplein for the railway. This does not rule out that the ditch to the east and possible remains of a similar ditch to the west were intentional constructions of some undefined purpose.

Putuni – Map 17

The Putuni appears in Bandelier's notes as a square of stones within a square of stones, which

he finds remarkable for their smoothness. A segment of the eastern wall had been exposed before Bandelier's visit, perhaps to quarry smaller, portable stones for constructions, and a large looters' hole mars the southwest corner in the area found to contain shaft tombs with a few precious metals (Couture and Sampeck 2003). The most significant change has been the appearance of several carved stones that lie in a disorganized pile at the entrance of the eastern wall. More of these elaborate carved blocks were exposed in 1903 and subsequently looted (Posnansky 1945). From this information, and the present remains, the eastern entrance to the Putuni appears to have been quite elaborate. Beyond this, however, the Putuni's basic form has changed little since Bandelier's visit, save for the exposure of the southern wall during excavations in the mid-twentieth century, and the uncovering of a few additional stones.

Semisubterranean Temple – Map 18

Bandelier's notes on the Semisubterranean Temple are of particular interest, because they predate the excavation of the temple undertaken by Georges de Crequi-Montfort in 1903 and the full excavation and reconstruction done by Carlos Ponce Sanginés in the 1960s. In its buried state, the temple does not warrant much of a mention from Bandelier other than that it is another courtyard. Although the temple is defined on three sides by pillars that were visible at the time, other pillars are noticeably absent. Chief among these are the two large pillars that frame the stairway on the southern wall. It was not until Ponce's excavation that these pillars were discovered collapsed toward the center (Ponce Sanginés 1990). One further note on map 18 is that, although Bandelier identified a corner where the southwest corner exists today, the row of stones that makes up the western wall extended 12.8 m beyond its current length. The two stones that make up this extension have since been removed and, assuming that these stones are architectural and not an alignment of field stones, may call into question some aspects of the accuracy of the temple's reconstruction.

East of the Kalasasaya – Maps 18, 19

A similar problem of stone removal plagues Bandelier's maps of the area east of the Kalasasaya. These areas show up as extensions of the maps of the Akapana (19) and the Semisubterranean Temple (18). One feature that is currently missing is a row of stones extending southeast from the northeast corner of the Kalasasaya, of which Bandelier states, "I am confident that it indicates a wall of some kind." Bandelier found this "wall" significant enough to be included in his finalized map of the site. If this were indeed a wall, it would be of great significance, as its alignment is greatly skewed from that of the rest of the monuments in the site center. This wall line terminates in a wall running north-south, located roughly 167 m southeast of the Kalasasaya. Although this wall was no more than four stones in a line, none of its vestiges survives today.

A last feature of note is a row of stones near a "pond-like depression" that shows up to the east of the Akapana and is featured in a separate sketch on page 14. Most of the stones in this portion of the site have been removed, although the depression remains. Bandelier's observations allowed geophysicists to recognize circular anomalies in their images and the remains of ponds (Koons, chapter 12). A small excavation along the edge of the circular anomaly revealed a dense stratigraphy of clay-rich sediment consistent with the bottoms of ponds. Whether this pond is modern or the remains of a Tiwanaku-period structure has not yet been determined.

Kherikala – Map 20

A map of the Kherikala is included as part of a sketch that Bandelier labels "the last vestiges of Ruins west of Ak-kapana and the courts." The five stones that he uses as references are still in their earlier locations, as they make up the four corners of the Kherikala, plus an additional stone 30 m south of the Kherikala complex. Most of the other stones on his map, however, have since been relocated. One missing stone has since been moved to the site museum (fieldnotes, 22). The stone is roughly 1.2 by 0.9 m and displays an Andean cross

and a large notch, indicating that it may have been originally inserted into another stone.

Kantatallita – Map 21

The map of the Kantatallita is a case where analysis is hampered by a lack of detail in Bandelier's descriptions. We do know that one particular stone, a miniature and stylized carving of a temple known as the Maqueta Stone, has remained in situ, as Bandelier offers a detail sketch of it—drawn by his wife, Fanny—on page 22. However, the other blocks in the area are difficult to distinguish, as they simply show up as ordinary stones in Bandelier's maps. From the map, it is clear that some stones have been moved, while others have recently been uncovered and others still remain in situ. One stone we can be certain of, however, is the reference stone G, on which the rest of the map is based, as it remains in this location today.

North of the Kalasasaya – Map 23

The area north of the Kalasasaya, described in the map on page 23, is the area that has been most drastically altered since it was illustrated by Bandelier. Roughly halfway along the northern wall of the Kalasasaya, Bandelier mentions sighting a distinct row of stones that forms a straight line extending to the north. Additionally, a straight row of stones is clearly visible on the other side of the road to La Paz running parallel to the Kalasasaya wall about 61 m to the north of the northwest corner. This feature had been uncovered in part by the 1903 Crequi-Montfort excavations. Interpreted by Vranich as the facing to a terrace (Vranich 2009), the feature is no longer visible today. The one feature that does remain, the headless stela, had not been uncovered at the time of Bandelier's survey, although several looting operations that had been conducted in its general area uncovered what he referred to as "foundation of houses."

Pumapunku – Map 24

The Pumapunku also warrants several illustrations in Bandelier's notes. First, there is an overview of the entire monument on page 24. This is followed by several detailed illustrations of the architecture. Drawing particular attention is the series of sandstone slabs on the east side of the platform of the Pumapunku, and it is in these drawings that the problems of Bandelier's scale become most evident. Take, for example, the illustration of slab B on page 31. There is a piece of this slab, labeled B1, that seems to be a narrow block tacked onto the side. Yet upon reading Bandelier's measurements, it becomes clear that B1 is nearly half as wide as the slab itself, and that the shape was distorted by the limitations of Bandelier's notebook paper.

There are several additional carved stones to which Bandelier devotes separate sketches, and all of these can still be found in the Pumapunku area. Their exact location, however, is somewhat more problematic to discern, as excavations have been conducted throughout the entire southern and western faces of the monument which have moved many of the stones that were noted on Bandelier's map. Of particular interest is an area located at the northwest corner of the monument, where Bandelier mentions a stone statue. As this area is currently located on cultivated farmland outside of the fence, it was most likely a statue described as the "water god" by Posnansky, who notes it a few decades later in a different location (Posnansky 1945). This monolith has since been broken in two and moved to the site museum.

Bandelier notes that a kilometer farther south are the remains of a spring defined with monumental stones. He also notes a similar monumental spring to the north of the village of Tiwanaku. The first spring is known and still contains several in situ stone blocks; nothing remains of the latter spring.

BANDELIER'S TEXT

While the maps contained in Bandelier's fieldnotes should warrant the most attention, there are also some noteworthy elements of the text that can guide further study. Bandelier often mentions features of the site that have yet to be extensively studied by subsequent archaeological projects. For some of these features, his source is an informant named Calcina, whose reputation is questionable at best. Bandelier calls him "somewhat confused" and points out that his stories often have "quite a conflict with the other statements + tales" (fieldnotes, 40). However, Bandelier offers proof that he himself witnessed some of the features men-

tioned by Calcina but that are unknown today. Perhaps the most intriguing of these anecdotal features is a layer of human bones allegedly located beneath the center of the village. Bandelier describes the feature thus:

> This afternoon, [Father] Escobar led me to a place in town where a cut had been made, lowering thereby the alley by about five feet. On both sides of that cut, for a distance of several hundreds of feet, and at depth below the surface of from two to three feet, a seam of ashes, mixed with Pottery and human bones, is seen throughout. Many skulls have also been exhumed there. That seam, he says underlies the whole village. (fieldnotes, 34)

This seam has never been explored in depth by any subsequent archaeologist, and, unfortunately, Bandelier does not provide any detailed information about its location, making it difficult to use these notes as a jumping-off point for further inquiry. Although the layer may be simply a description of a Colonial-era burial ground, a lecture delivered by Fanny Bandelier in Mexico in 1926 provides further information ("Tiahuanaco," Bandelier collection, 1880–1966, Box 14, Museum of New Mexico Library, Santa Fe). The skulls, she said, show evidence of cranial deformation, a practice that was banned by the Spanish authorities by the late sixteenth century, an indication that this layer is associated with a pre-Columbian area of occupation and burial. However, practice of cranial deformation did continue for a time in remote areas such as Tiwanaku, so further research would be necessary to more securely date this cemetery.

An additional undiscovered feature mentioned in Bandelier's diaries is a drainage canal that allegedly links the Pumapunku with the Akapana and the rest of the monumental core. The source of this feature, however, is oral tradition from Bandelier's informant, Calcina:

> [Calcina] states that a channel of water, according to his recollection four feet deep and two feet wide, still connects Pumapuncu with Akapana but is now covered with earth. He saw that channel. The work is of stones without any mortar, and the bottom stones rest on "GOBO" wood in especially wet and deep places. He offered to lead me to the spot. (fieldnotes, 40)

Unfortunately, Bandelier never took Calcina up on his offer, and we can only speculate as to the truth of his account. Nonetheless, the detail of his description, the fact that the informant at least claimed to know the channel's location, and the appearance of similar tales of underground conduits from travelogues of Bandelier's contemporaries make this feature a worthwhile one to pursue. Ground-penetrating radar surveys carried out at several locations throughout the monumental core have found a number of shallow conduits (Koons, chapter 12).

Another item of note is Calcina's recollection of someone who visited the site prior to Bandelier, who went by the name of "Doctor Syriachi." The motives of his visit were more for personal enrichment than scientific exploration, as the object of his digs was to find precious metals buried within the site. The details of his looting are sketchy at best, since Calcina mixes factual account with legend to describe Syriachi's investigations. For example, Calcina claims that Syriachi is responsible for the looted trench in the center of the Akapana, an excavation that resulted in the discovery of "a cupola or vault of yellow colored stone . . . filled with water" but none of the sought-after precious metals (fieldnotes, 40). At this point, however, Calcina's story turns more unreliable, as the workmen see visions of flaming horses right before the walls of the excavation trench collapse. While Syriachi's search on the Akapana yielded cataclysmic results, his excavation at Pumapunku, according to Calcina, was apparently more successful, as mining beneath the large slabs on the eastern edge resulted in the discovery of a large chamber of gold.

CONCLUSION

There is a tendency to regard the notes of archaeologists and scholar-travelers from the turn of the century as amusing anomalies often tainted with biases of the time. Even Bandelier expresses disappointment at the exaggeration in the drawings done by E. George Squier in his *Peru: Incidents of Travel and Exploration in the Land of the Incas* (1877), remarking that "Neither in size, nor in number of slabs, nor in ornamentation, do they correspond to my ideas gathered from books" (fieldnotes, 8). Bandelier himself is not free from error. For example, he is generally convinced that

the Akapana is a "natural [and] not artificial" formation, and that several of the larger blocks found around the site are "simply drift of great size" (fieldnotes, 8, 12). That said, Bandelier's insistence that "Exact measurement and clear observation is the only way to do the work" (fieldnotes, 8) has left us with a very accurate record of the monuments he did find. Furthermore, Bandelier shows an interest in pieces of the site that are less monumental in nature. The sketches of the area east of the Akapana, for instance, make note of several small walls that indicate then modern houses. Even his notes of the terrain and the cultivation of certain areas proved useful to modern researchers, such as geophysicists, who need as much information as they can get about the history of construction at the site in order to interpret their data and distinguish relevant remains from modern constructions (Koons, chapter 12).

Bandelier's maps are not a definitive guide to which monuments of the site remain in situ, since desire to relocate and reuse the stones of Tiwanaku predates any archaeological investigations of the site. For example, the cathedral of Tiwanaku is constructed almost entirely of stone from the monumental core, and contemporary research has shown that many of the stones in the Putuni were relocated from other portions of the site during the Tiwanaku era (Gardella 2003). The last century has been particularly destructive, with the construction of the railway and the ability to take stone as far as La Paz with little effort. And the development of Tiwanaku as a tourist destination has increased the desire for archaeologists and developers to rebuild existing monuments in more eye-catching, yet historically inaccurate, ways (Gasparini 1973). Bandelier's measurements can also be used as a guideline to judge how the site was laid out before the massive reconstruction was undertaken by these modern archaeologists.

This chapter reviews the notes and maps of Adolph Bandelier with a view to presenting a complete view of the ruins as seen in 1894, along with the thoughts and observations of one of the most perspicacious scholars of our field. The meth - ods used in this study are applicable beyond the anomalous cases of unfinished projects by notable scholars. Even accurate maps are interpretations: features have been reduced, blurred, and even removed. Going back to the original sources allows us to see what has been lost from draft to final product; margin comments and doodles record what appears to be minutiae of an overwhelming jumble of stone. A destructive century later, a passing glance and a quick note jotted in a field book may be all that is left of a construction with significant implications for our ideas on the layout of the site. Once we have replaced as much of the site as we can from the historical data, we can move to the far more laborious and, ultimately, destructive field method of excavation.

Chapter 11

A Radiocarbon Chronology of the Pumapunku Complex and A Reassessment of the Development of Tiwanaku, Bolivia

Jason Yaeger and Alexei Vranich

Tiwanaku was one of the largest pre-Columbian cities in South America, located near the shores of Lake Titicaca at 3840 m.a.s.l. Scholarly estimates for the population at its apogee range from eight to twelve thousand (Bandy, chapter 7) to fifteen to twenty thousand (Janusek 2004b; Kolata 2003c, 200). This populace lived around a nucleus of temples and public plazas, while its rulers dominated the resource-rich Titicaca Basin and exerted influence from the high Bolivian Andes to the coastal deserts (Browman 1997b; Kolata 1993). Descriptions of Tiwanaku focus on the site's two zones of monumental architecture. To the east of the modern town of Tiahuanaco sits the main core of six impressive buildings: the Semisubterranean Temple, the Kalasasaya, the Putuni, the Kherikala, the Kantatallita, and the Akapana (fig. 11.1). A kilometer to the southwest lies the Pumapunku complex, an alignment of plazas and ramps centered on the Pumapunku's Main Platform (fig. 11.2). This monumental core is surrounded by residences and non-monumental structures, the boundaries of which are inferred from the presence of Middle Horizon ceramics on the ground surface, which are estimated to cover 6 km^2 (Kolata 2003c, 200).

This description is adequate for a general orientation to the site, but the reality on the ground is more complex. Smaller monumental constructions lie scattered throughout the site's urban core and beyond, extending through at least 10 km of the valley. For example, 300 m south of the Akapana is the Mollo Kontu mound (Couture 2003), associated with a large residential sector of the site investigated by Proyecto Jach'a Marka (Couture et al. 2008). A kilometer to the south of the Pumapunku lies a monument known as Choquepacha, a natural spring that was modified by the addition of an andesite basin and canals. There are undoubtedly other smaller monumental constructions waiting to be discovered, some of which have already been documented, as in the case of the "Bath of the Incas" that Max Uhle photographed in 1893 and a monumental fountain noted by Adolph Bandelier that same year somewhere northwest of the modern town of Tiahuanaco, both of which are now lost. Historical references to large walls under the church in Tiahuanaco and the quantity of cut stone blocks uncovered during modern construction projects suggest the Colonial town was founded on important Middle Horizon remains as well (see chapter 10). Finally, 8 km south of Tiwanaku's monumental center is Pokotia, site of a monumental platform built using materials and construction techniques similar to those used in the Pumapunku platform (Vranich and Koons 2006).

Tiwanaku's size and architectural complexity suggest a complex history. Although the site's architecture has been lauded for its monumental scale, graceful proportions, and fine masonry (Cobo [1653] 1990; Garcilaso de la Vega (1604) 1987; Posnansky 1945; Protzen and Nair 1997, 2000), our interpretations of these impressive monuments have been largely ahistoric until

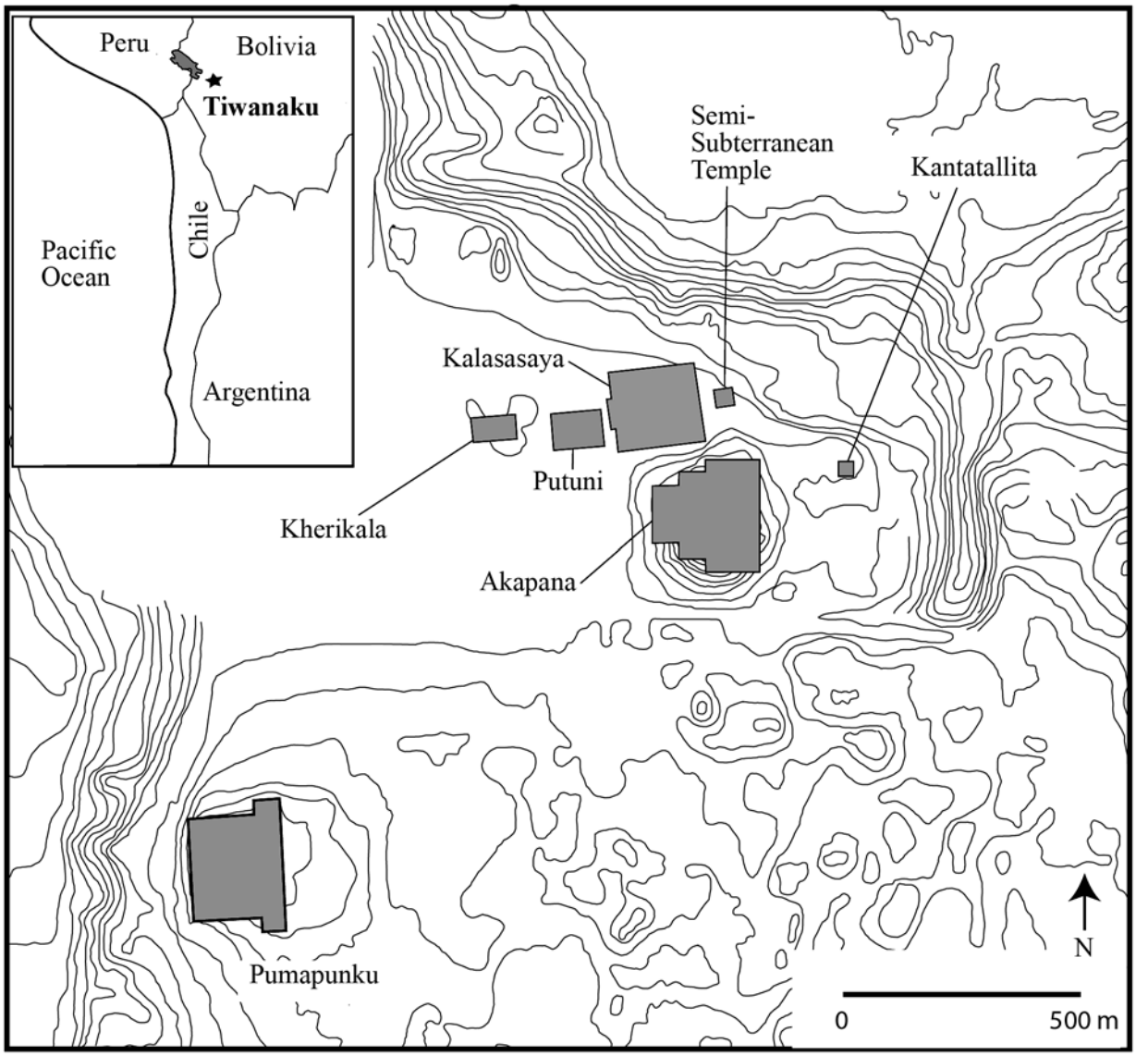

FIGURE 11.1 Tiwanaku. *Topography after Kolata 2003b: map 1a.*

quite recently. The massive stones of many of Tiwanaku's structures lie toppled, and other buildings appear to sit unfinished, facts that have stimulated theories that an earthquake, invasion, revolt, deluge, or some other sudden catastrophe destroyed the site and displaced its populace (Posnansky 1945). Catastrophic explanations of the collapse of high civilization resonated with the Romantic worldview held by the early travelers and scholars who wrote about Tiwanaku in the decades following Bolivia's emancipation from Spain. They gained new life in the later twentieth century with the rise of environmental models of the collapse of complex societies (Binford et al. 1997; Gill 2000; Haug et al. 2003; Weiss and Bradley 2001). Such models usually frame collapse as the result of a society's inability to adapt to environmental and climatic changes without significant structural transformations in population size, social arrangement, and political organization, a threshold that is usually—but not necessarily—seen as occurring at an apogee of demographic size and political complexity.

An obstacle to understanding Tiwanaku and other pre-Columbian cities from a historical perspective has been the application of structuralist models of urbanism and urban form, following the seminal work of Paul Wheatley (1971; also

Ashmore 1991; Fritz 1986; Pasztory 1997). In these models, the components of a city's plan, particularly the more salient monumental structures and public spaces, are understood through the lens of cosmology. Cities are cosmograms, recreating the cosmos here on earth and providing important spaces for ceremonies and rituals that legitimate the city's social and political orders. This approach often takes a synchronic view of a city's plan as a coherent whole but need not always do so (e.g., Ashmore 1991).

Through a closely argued and detailed analysis of the architectural and iconographic features of the major structures, their spatial distribution within the site, and their relationship to the larger landscape, Alan Kolata (Kolata 1993, 2003c; Kolata and Ponce Sanginés 1992) has proposed a reconstruction of Tiwanaku's social and political structure. Central to this model is the relationship between the Akapana and the Pumapunku platforms, which he sees as references to and mimetic re-creations of sacred mountains and shrines for high- and low-ranking elite lineages. Kolata and colleagues further argue that a prolonged drought beginning around AD 1150 presented an environmental threshold that destabilized the complex agricultural system that sustained Tiwanaku and led to its collapse (Binford et al. 1997; Kolata 2003a, 2003c; popularized in Fagan 2008). Recent excavations of Tiwanaku's monumental architecture, however, reveal evidence that the site's development did not follow a gradual trajectory toward some preconceived form, nor was its decline and abandonment abrupt and cataclysmic (Couture 2002; Erickson 1999; Isbell and Vranich 2004; Janusek 2004a, 2006; Vranich 2006). These excavations were complemented by a rich body of data from the site's non-monumental sectors that demonstrates the existence of a complex and cosmopolitan society (Couture et al. 2008; Janusek 2004a; Kolata 2003b).

In this chapter, we focus on the site's history as revealed through its monumental architecture, particularly the Pumapunku. Radiocarbon dating is an especially important tool in this endeavor, given ongoing debates about the discreteness and boundaries of the ceramic phases at Tiwanaku (Augustyniak 2004; Burkholder 1997; Isbell and Burkholder 2002).

ARCHAEOLOGICAL INVESTIGATIONS OF THE PUMAPUNKU

Some of the earliest accounts of Tiwanaku, written in the opening decades of the Colonial era, include descriptions of the Pumapunku (Cieza de León [1553] 1959; Cobo [1653] 1990). Nearly every traveler and scholar passing through the area penned a description or sketched a drawing of what was considered one of the most remarkable buildings of the pre-Columbian era. These descriptions range from detailed and accurate to vague and misleading, but together they provide important insight into the structure's original form (Vranich 1999).

Leonce Angrand made the first accurate map of the platform in 1848 (Prümers 1993), but systematic excavations did not occur until 1977 and 1978, when Gregorio Cordero Miranda (1978; Arellano L. 1991) and the Centro de Investigaciones Arqueológicas en Tiwanaku probed all four sides of the platform and its summit (fig. 11.2). These efforts were followed in 1981 by Jorge Arellano L. (1991), who conducted excavations along the Pumapunku's north side and in the southeast and central parts of the Main Platform, including the sunken court.

In 1989, the Dirección Nacional de Arqueología de Bolivia (DINAR) embarked on an ambitious plan to excavate and consolidate the platform's final-phase architecture (Escalante Moscoso 1994). These efforts resulted in the most extensive excavations ever conducted at the Pumapunku, revealing most of the south, west, and north faces of the platform and amplifying the excavations in the central court. These excavations, coupled with the work by Cordero Miranda (1978) and Arellano L. (1991), allowed for a sophisticated understanding of the Pumapunku's final form (Escalante Moscoso 1994). Unfortunately, unforeseen funding shortfalls led to the early termination of this project, and plans for further excavations, analyses, and publication efforts were suspended.

In 1995, Alexei Vranich began a project to understand the Pumapunku's architectural form and function as part of the research for his dissertation (1999). A laser theodolite survey of the topography and stone-by-stone mapping of the

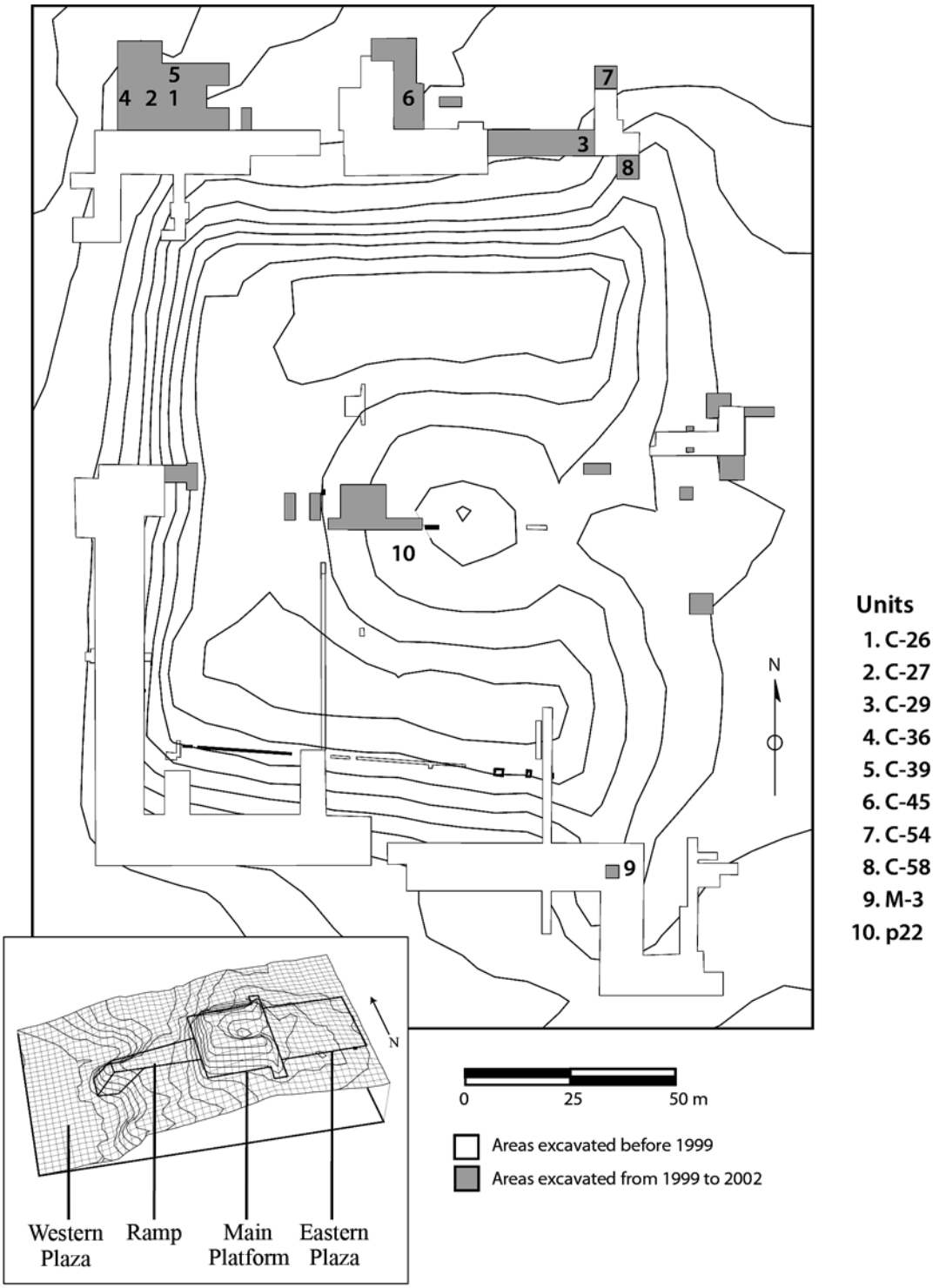

FIGURE 11.2 The Pumapunku complex.

architectural features revealed by the earlier excavation projects allowed for a more detailed reconstruction of the Pumapunku and its architectural history. Additional excavation units were strategically placed to expand preexisting trenches, to profile looters' holes, and to probe critical points in the structure's stratigraphy. The accumulated data were rendered in AutoCAD, allowing for extrapolation of architectural elements across both unexcavated and damaged areas. Other voids in

the archaeological record left by Colonial and Republican looting were filled by utilizing descriptions, drawings, and photographs in published and unpublished historical sources and early scientific studies. Selective results were published in 2006 (Vranich 2006). The resulting construction sequence for the Pumapunku is presented in figure 11.3.

Vranich returned to Tiwanaku in 1999 to address several questions that remained regarding the Pumapunku, in particular the manner that movement and circulation across the complex changed as the fortunes of Tiwanaku rose and fell. He sought to answer these questions with targeted, small-scale excavations along the platform's primary access points. Simultaneously, he laid the groundwork for a larger investigative effort to re-create the history of construction and the nature of the ritual experience in the complex sector of the site dominated by the Akapana platform.

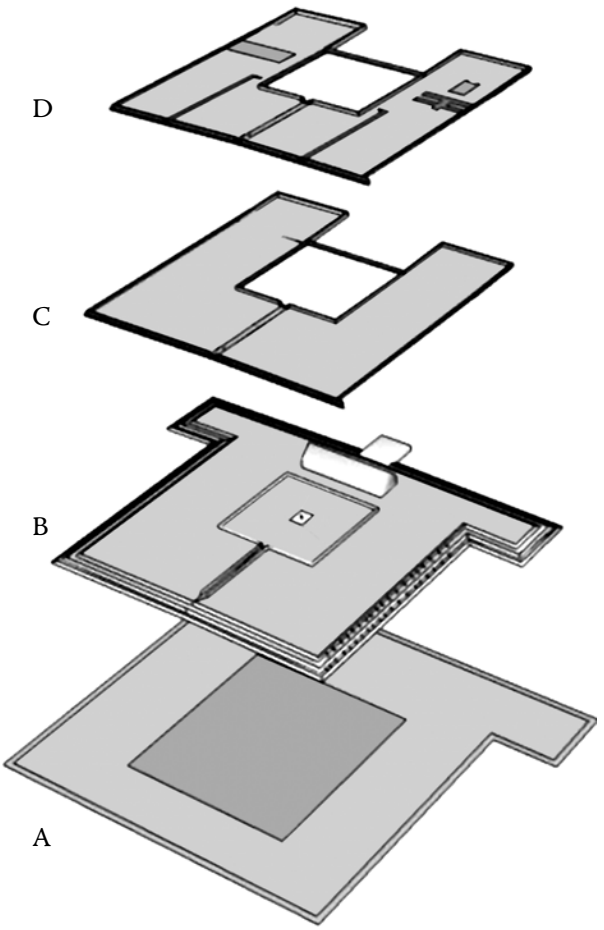

FIGURE 11.3 Middle Horizon construction sequence of the Pumapunku.

Yaeger joined Vranich in 1999 and initiated the Inka Settlement Program. This study sought to understand the nature of the site's Inca occupation, the reasons for the Inca reoccupation of this sacred center, and the ways in which they modified preexisting structures to meet those objectives. Over the course of four seasons of fieldwork at Tiwanaku (1999–2002), this research program completed a detailed surface survey in order to delimit the Inca settlement, a geophysical survey immediately north and south of the Pumapunku to identify buried structures and other features, and extensive excavations that focused particularly on the zone immediately north of the Pumapunku (A. Smith 2002; Vranich et al. 1999, 2001, 2002; Yaeger and López Bejarano 2004).

RECONSTRUCTING THE HISTORY OF THE PUMAPUNKU

The data from the projects described in the previous section allow us to re-create the construction history of the Pumapunku in considerable detail (Vranich 1999, 2006). Its construction began with the excavation of a foundation pit that ranged in depth from 1.6 m along the platform's perimeter to 0.8 m in the center. This foundation pit was then filled in to create the platform's foundation and inner core (A in fig. 11.3).

The edges of the foundation pit were filled with multiple layers of river cobbles laid in a wet mortar of sand mixed with clay (A in fig. 11.4). This dense composite fill provided a stable foundation for the weight of the masonry erected above it. The final layer of the composite fill was made with evenly spaced, flat-topped cobbles that Vranich calls " pad stones," which served as contact points for the finely cut blocks of the basal courses of the revetments. A mass of fine and homogeneous clay, lacking any internal stratigraphy (B in fig. 11.4), fills the center of the foundation pit. After 2.84 m of clay fill, the builders placed layers of clay and sand to level out this dense mass and create a flat base for the summit of the first phase of the platform. At the top of the clay fill, under the layers of clay and sand, Vranich found a thin but extensive layer of burned sediment and

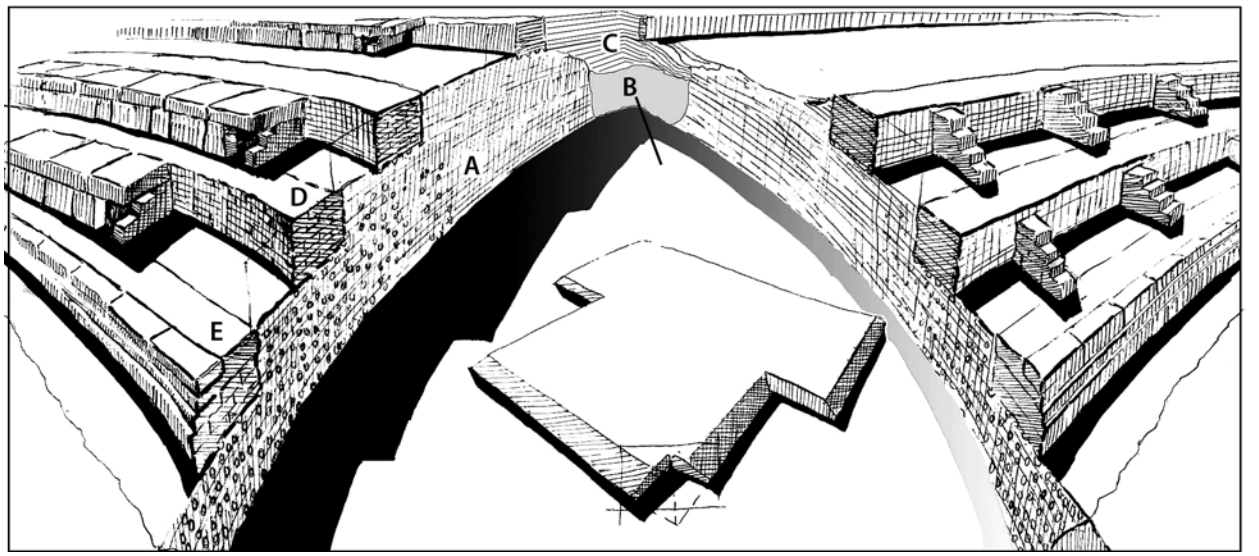

FIGURE 11.4 Cutaway view showing revetment construction technique.

charcoal that provided material for a radiocarbon date (OS-17860), discussed below.

From its inception, the Pumapunku's Main Platform had a T-shaped footprint, 167.4 m long on its west side and 116.7 m on its north and south sides. The crossbar of the T forms its east side, with two wings that extend out 27.6 m (fig. 11.2; A in fig. 11.3). The exterior of the first version of this platform (B in fig. 11.3) consisted of three terraces or revetments. The second and third revetments had rougher interior retaining walls (D in fig. 11.4) and finished exterior faces (E in fig. 11.4), while the first revetment lacked the inner retaining wall. The cut-stone masonry of both the interior and exterior facings sat on pad stones set in layers of composite fill (A in fig. 11.4).

The finished face of each revetment was constructed of polished andesite blocks, which were securely capped by wider slabs of sandstone. The retaining walls were composed of well-coursed blocks of well-cut but unpolished sandstone. Every 2.95 m, a buttress extended out to the exterior face. As was the case with the Akapana (Vranich 2001), these buttresses were bonded to another line of rough blocks set immediately behind the finished facade, thus forming a series of interlocking bonded cells that could withstand the weight of the core fill of the platform. Colonial and Republican stone quarrying removed most of the cut stones of the upper revetments, but the flat pad stones and the occasional block that escaped notice allow us to confidently reconstruct the three-terraced form of the platform's initial phase.

Excavations in 2000 and 2001 documented three dedicatory offerings placed immediately under the fine exterior andesite facings of the Pumapunku's revetments. Their placement under masonry features parallels that of later dedicatory offerings in the Putuni (Couture and Sampeck 2003, 261). Two were set under the first revetment, one near the east edge of the north face, and the other along the west face of the north wing, just north of its corner with the platform's north face (units C-29 and C-54, respectively; see fig. 11.2 for excavation locations). The subsequent disturbance of the offerings makes it difficult to discern whether they were placed in pits excavated into the composite fill or directly within the composite fill itself. Regardless, the offerings clearly were deposited prior to the placement of the final facade of the first revetment, as they sit directly under the outermost line of stones of that revetment. In unit C-29 we found human remains consistent with an MNI of one adult male (D. Blom, personal communication); skeletal elements in unit C-54 included the remains of at least three individuals: one child (four to eight years old), and two young to middle-aged adults (D. Blom, personal communication). A third offering containing camelid remains was found in

unit C-58, set among the pad stones that supported the masonry of the third revetment. The locations of these deposits within the architectural stratigraphy demonstrate that they were integral to the construction of the first version of the Pumapunku. The Middle Horizon architects subsequently implemented two major modifications to the Pumapunku (C and D in fig. 11.3), adding to the height of the platform and resurfacing its summit (Vranich 2006).

Precisely dating these three construction phases has proven daunting. In his 1978–79 excavations, Cordero Miranda (1978) observed that most of the ceramics he recovered belonged to the Tiwanaku IV phase, while Tiwanaku III ceramics were found along the east side and center of the Pumapunku platform. Inca ceramics were located on the northeast side of the platform, and Inca-Pacajes ceramics were dispersed across the platform (Cordero Miranda 1978). Unfortunately, we lack detailed information for the provenience of these materials and thus cannot determine whether they relate to the construction or use of the structure. Vranich's excavations recovered very little ceramic material from the fill used to build the Pumapunku, which was so homogeneous and clean that it might have been excavated from natural alluvial deposits. Consequently, we are challenged to securely date the structure's history of construction and use.

We do have two important contexts, however, that bracket the structure's construction and use. The first is the offering placed under the first revetment in unit C-29. As noted above, this offering was disturbed in antiquity, and its contents were scattered. We recovered a collection of large, well-preserved sherds from the loose matrix at the bottom of the pit associated with the disturbance (feature 260). These included fragments of *sahumerios*; *escudillas* of micaceous paste ranging in color from beige to brown, with wide rims decorated on the interior with vertical black lines; and small jars (fig. 11.5). John Janusek (personal communication, August 2008) examined drawings and photographs of these sherds and identified the collection as an Early Tiwanaku IV assemblage, with a few sherds that could date to the Tiwanaku III phase. His observations point firmly to a date

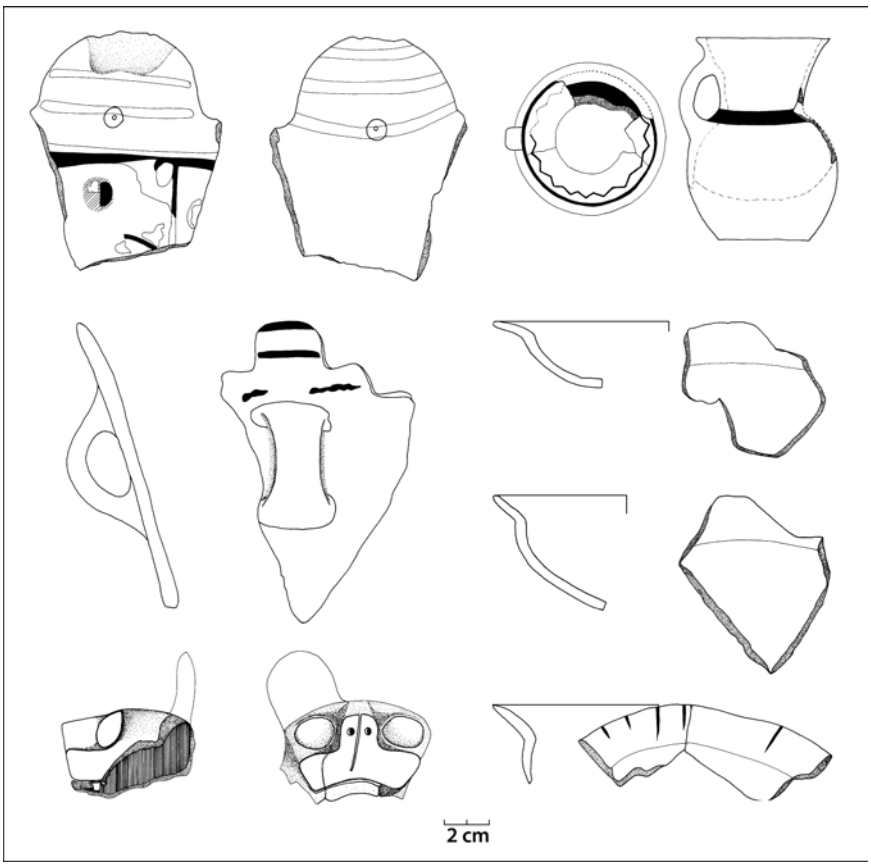

FIGURE 11.5 Selected ceramic sherds from feature 260, the disturbed dedicatory offering in unit C-29.

early in the Early Tiwanaku IV phase, an assessment consistent with the radiocarbon data discussed below (cf. Knobloch, forthcoming, who argues that Tiwanaku IV and Tiwanaku V ceramics are largely contemporaneous).

The other deposit that is crucial for anchoring the Pumapunku sequence in time is a dense lens of ash, llama bones, and ceramics found along the south side of the Pumapunku, extending in a talus slope from the platform's summit down to the base of the first revetment (stratum 3 according to Arellano L. [1991], level 4 in Estévez Castillo's field report [1990], and stratum 4 in Burkholder's analysis [2000]). Vranich (2006, following Burkholder 2000) interprets this unusual stratum as the product of activities in the sunken central court and in the structures that sat atop the platform surrounding the sunken court, which was deposited as refuse along the southern, unfinished side of the platform. Burkholder (2000; personal communication, 2008) analyzed material from this context in 1999 and concluded that the large sherds and many refits suggested a primary refuse context, deposited over a relatively short span of time. Burkholder determined that approximately 44 percent of the assemblage consisted of *kero* and *tazón* fragments. It also contained libation bowls akin to Janusek's type 10.1.2 *sahumadores* (Janusek 2003b), orange in color and roughly slipped, lacking burnishing; and storage jars of Janusek's types 2.1 and 2.2. Type 2.1.1 collared jars (*tinajas*) comprised 16 percent of the assemblage. This combination of forms suggests a date around the turn of the ninth century AD (Burkholder 2000; personal communication, 2008), at the end of Tiwanaku IV or early in Tiwanaku V. Thus, we are confident that the structure had reached its final Middle Horizon form—that is, both major additions to the platform had been completed, raising it to the height shown in D in figure 11.3—by that period.

The next set of activities we can identify in the stratigraphic sequence of the Pumapunku relates to the disturbance of the offerings mentioned above. Our excavations in units C-29 and C-54 revealed pits that had been dug under the front face of the Pumapunku in order to access the two dedicatory offerings placed under the first revetment. The composite-fill matrix that was removed during this digging was piled up to one side, leaving a pile of cobbles and flat-topped pad stones adjacent to the front of the first revetment. The contents of the offerings were accessed and dispersed, left scattered on the ground along the front of the revetment and in the open pits left by the reopening. The pits were stratigraphically very distinct, filled with dark, loose matrix that contained substantial amounts of charcoal. In unit C-29, this loose matrix was partially covered by a thin deposit of dark and semi-compact matrix, heterogeneous in color, with fragments of fire-hardened clay and some charcoal. Its place adjacent to the pile of cobbles and pad stones suggests that it represents the erosion of the pile of redeposited composite fill down on top of the filled-in pits. We dated one charcoal sample from this stratum (AA65280).

This erosional layer in turn was capped by a thick stratum of sediment that includes Early Pacajes sherds, which we interpret as the accumulation of sediment through erosion and other natural processes prior to the Inca reoccupation of the Pumapunku. This stratum suggests that the offerings were removed prior to or during the Early Pacajes period, consistent with radiocarbon dates discussed below.

We interpret the reopening of the offerings as acts of desecration and/or pillaging, given that the human and camelid remains interred in the offerings were scattered, the associated ceramic vessels broken, and the most valuable objects removed, leaving only a few very small fragments of valuable items, such as a small bluestone bead and a piece of gold foil that apparently went unnoticed. We infer that the people responsible for reopening the offerings knew where to target their excavations; in the contiguous excavation of more than 100 m of the Pumapunku's north face, no additional pits have been identified. After these acts, it seems that the Pumapunku was no longer an important ritual or political focus at Tiwanaku.

Two of our radiocarbon dates (AA65282 and AA68185) come from carbonized wood associated with the scattered bones and broken pottery from the offerings. The charcoal could have been derived from the original offerings, whether immolated during their placement (Manzanilla 1992) or burned during the later disturbance, or it could be from other activities relating to the re-

opening of the offerings. A key question for this chapter is the origin of the charcoal found in the pits. We suggest below that the two samples we analyzed derive either from fuels used to burn the offerings or from other activities at the time of their removal, not from materials placed at the time of the original offerings.

The scattered remains of a third offering were found farther upslope on the Pumapunku platform in unit C-58. Colonial or Republican stone quarrying had disturbed this area significantly. This plundering followed a common sequence on the Pumapunku, serendipitously recorded in an early description of the quarrying of the platform for the construction of the town church (Castro [1657] 1906): once people located the face of the revetment, they trenched down to remove the blocks, as if following a seam. Erosion has filled in the trenches over the centuries, but they remain stratigraphically quite distinct. We excavated unit C-58 to search for Inca construction on the top of the second revetment at the corner where the main body of the platform meets the north wing. Excavating down to the pad stones that were set into the composite fill to support the third revetment's masonry, we found that the revetment had been almost entirely removed. Only one cut-stone block of the retaining wall remained in situ. "Ghost walls," the filled-in voids left where other stones had been removed, showed the location of other elements of the third revetment, including one of the buttresses.

In the area between the original locations of the retaining wall and the final face of the third revetment, we found scattered adobes and pieces of the green surface that originally capped the first version of the Pumapunku's Main Platform (B in fig. 11.3), suggesting a mixed context that included redeposited architectural materials created by the quarrying of the third revetment and quarrying activities upslope. Llama bones were found scattered throughout this redeposited material. Feature 315 represents a much denser deposit of bones and sherds in a circular cluster 85 cm in diameter. Although not articulated, the much greater density of these bones suggests that they were minimally disturbed by later looting. The context and association suggest the feature was related to the construction of the Pumapunku and placement of the dedicatory llama offerings. We dated a piece of carbonized wood from this feature (AA68183).

On the south side of the Pumapunku, in unit M-3, we found another pit excavated into the clay-and-cobble foundation fill of the Pumapunku's first revetment. Designated feature 320, it measured 110 by 95 cm and reached a depth of approximately 1 m. It is stratigraphically analogous to the pits that disturbed the northern offerings in units C-29 and C-54 described above, but it is not positioned symmetrically with any of them. It contained loose, reddish black matrix, sandier near the bottom, with some animal bones and ceramic sherds. The pit's internal stratigraphy revealed a discontinuous lens of ashy soil with some charcoal 20 cm below the top of the pit. We interpret this pit as a probe excavated in search of an offering like those on the north side. The pit is not as large as those on the north side, and it does not extend under the first revetment. In contrast to the offerings on the north side, this pit was refilled sometime in antiquity. We dated two samples from this pit, a piece of carbonized wood (AA68184) and a nodule of carbonized sediment (AA65286), both from the level associated with the ashy matrix.

The refuse deposit analyzed by Burkholder, discussed above, lies to the west of this pit. Overlying that deposit is a second discrete stratum (stratum 1) that also has a high density of sherds. The small size of the sherds, coupled with a paucity of refits and an absence of whole vessels, led Burkholder (2000) to infer that this was a secondary deposit. The presence of Pantini plainware and Negro Pulido pottery suggests to her a date as late as the tenth century AD. Although neither stratum 1 nor 4 can be tightly linked stratigraphically to the feature 320 pit, the ceramic date of stratum 1 aligns relatively well with the carbonized sediment obtained from that pit (AA65286).

As mentioned above, the presence of occasional Early Pacajes sherds in our excavations demonstrates the continued occupation in the surroundings of Tiwanaku after its collapse, not surprising given the relatively high population levels of the Tiwanaku valley during that time (Albarracín-Jordán and Mathews 1990; Janusek

2004a; Mathews 2003). We did not, however, identify any Early Pacajes architecture.

The next group of activities we can identify at the Pumapunku involves the Inca reoccupation of the area. Despite conflicting histories that attribute the conquest of Pacajes territory, which included the Tiwanaku valley, to Pachacuti and to his successor, Topa Inca (Pärssinen 1992), archaeological data suggest that Inca expansion into the southern Titicaca Basin occurred in the mid-fifteenth century, and that by 1470 or so, the region was under Inca control (Arkush 2005b; Frye and de la Vega 2005; Pärssinen and Siiriäinen 1997; Stanish 2003).

Although previous excavators found offerings of miniature ceramics in the Kalasasaya platform, the Inka Settlement Program's survey and excavations demonstrated conclusively that the Inca occupation of Tiwanaku was focused to the west and southwest of the Akapana and other monumental structures that comprise the Middle Horizon core of Tiwanaku, extending generally north from the Pumapunku into the area occupied by the modern town of Tiahuanaco (A. Smith 2002; Yaeger and López Bejarano 2004).

At the Pumapunku, extensive excavations on the platform's first revetment and in the zone immediately north of the platform revealed well-preserved Inca architecture and other features. By assessing the different sectors of the excavated area in terms of their layout, internal features, and associated artifacts, we have identified several different activity zones (Yaeger and López Bejarano 2004).

As part of the reconfiguration of the Pumapunku to meet Inca ritual needs, a series of sacrificial offerings were placed at regular intervals along the Pumapunku's east face, just east of the massive stone slabs that formed the foundation of the Middle Horizon stone building that dominated the platform's east face. On the opposite side of the platform, the Inca built a small bath, which was fed by water that accumulated in the central sunken court of the Pumapunku and drained into an Inca holding tank by way of a Middle Horizon canal.

On the Pumapunku itself, the Inca placed a series of galleries on top of the first revetment, which were restricted to the zone where the north wing intersects the main body of the platform. Our excavations in these galleries found multiple, discontinuous activity surfaces, indicated by flat-lying artifacts and ash lenses. In some units, the uppermost surfaces were associated with Colonial ceramics and other artifacts, such as a silver needle. In unit C-29, the occupation was sealed by a heterogeneous layer of debris from the destruction of the Inca building. This layer included fragments of adobes, one finished and painted white; lenses of ash; and carbonized roof thatch (C-29-18). We dated one carbonized wood sample from this layer (AA68181).

These galleries overlooked an open plaza that extended from the north wing west to a sector of rectangular Inca buildings. Inside these buildings and in the adjacent corridors we uncovered extensive refuse deposits that contained, by and large, uneroded fragments of Inca pedestaled cooking vessels and Cuzco-style polychrome plates and *aribalos*; high frequencies of faunal remains, especially llama, but also including other mammals, birds, and fish; and a high density of charcoal. The large and uneroded character of the sherds and the presence of some articulated fish skeletons suggest that this material was minimally disturbed by postdepositional transformation processes, likely because it was covered by the structures' collapsed adobe walls soon after being deposited. Based on the contents of these deposits and their architectural context, we interpret them as the refuse from feasting activities that took place in the adjacent plaza. One of our carbon samples comes from the on-floor refuse deposit found in unit C-45 (AA68178).

Farther west, near the northwest corner of the Pumapunku's Main Platform, we uncovered portions of a residential sector. This zone includes a formal hall with a central dais along one wall, raised pedestals in the corners, interior niches, and fine, clay-plastered surfaces. The hall is surrounded by a series of rooms organized around patios that comprise an ancillary food storage and preparation area. Narrow corridors connect these different rooms and patios, and a wider perimeter wall likely encircled the entire compound.

We analyzed several carbon samples from this sector of the Inca settlement. These come from use-related contexts, such as a patio surface in unit C-36 (AA65283), the interior of a large, basin-

shaped hearth in a patio in unit C-27 (AA68182), and refuse deposits, such as the redeposited trash found on the floor of a room in unit C-39 (AA68179). This sector of the site was burned, sealing the Inca occupation under a layer of ash and carbonized thatch. Sample AA68180 is a piece of burned roof thatch recovered in one of the corridors in unit C-26.

Occupation at the Pumapunku continued after the Spanish conquest of the Tiwanaku valley. In 1539, Cieza de León ([1553] 1959) described Inca residences next to the Pumapunku, including the house where Huayna Capac's son Manco Inca was born, but does not mention anyone living in them at the time of his visit. Archaeological evidence documents that the Colonial inhabitants did in fact use preexisting Inca buildings. Although we did not identify any Colonial constructions, Colonial-era occupation is indicated by Colonial artifacts, such as those found in the galleries on the first revetment, mentioned above. We also documented Inca and Colonial strata in the exterior spaces immediately adjacent to the galleries. In many of the units we excavated there, we found a distinct layer of loose, greenish brown clay loam, almost free of inclusions or artifacts. This unusual layer was capped by heterogeneous architectural debris associated with the Colonial and Republican dismantling of the revetments and subsequent erosion of the Pumapunku's Main Platform. Its stratigraphic position just a few centimeters above the Inca surfaces of the galleries leads us to assign it an early Colonial date. Its origins remain unknown, but it is widespread across this sector of the site. In unit C-29, it overlies a stratum containing camelid bones, sherds, and both Inca and Tiwanaku sherds. In one area within this stratum, we identified feature 246, an especially dense and localized concentration of burned camelid bone, utilitarian vessel fragments, and abundant charcoal, which we interpret as refuse from domestic activities that occurred in the adjacent Inca gallery in the Early Colonial period. We dated one piece of charcoal from this late occupation stratum (AA65278) and another from feature 246 (AA65279).

The shallow stratigraphy of the Colonial occupation at the Pumapunku and absence of clear Colonial architectural features suggest that this area was abandoned shortly after the Spanish conquest. The gridded streets of modern Tiahuanaco, with its large central plaza, church, and *cabildo*, are likely the product of a *reducción* like those prescribed by Francisco de Toledo between 1569 and 1581 (Stern 1982), and Tiwanaku is explicitly described as a reducción settlement in 1583 (Ponce Sanginés 1977, 16). Nonetheless, the Pumapunku continued to be a locus for activities throughout Colonial and Republican times. Stone quarrying had a heavy, negative impact on the structure, leading to the erosion of the platform's clay core, while designs and graffiti pecked and carved into in situ and displaced blocks betray the occasional visitor and suggest that the complex continued to be an important place on the cultural landscape.

DATING THE HISTORY OF THE PUMAPUNKU

A suite of new radiocarbon dates allows us to anchor the architectural and occupational history presented above in absolute time. Table 11.1 presents the fifteen dates that comprise all known radiocarbon dates published for the Pumapunku (see Augustyniak 2004 for a comprehensive list). One date was collected during Vranich's dissertation research, and the rest were excavated by the Inka Settlement Program. The calibrated ages for the samples cluster into four groups (fig. 11.6), three that fall within the Middle Horizon, and one that sits squarely in the Late Horizon and Colonial periods. The clustering presented in figure 11.6 is strong, as the one-sigma ranges for the dates in each cluster show no overlap with those in other clusters. If one excludes AA65280, the date with the greatest standard deviation (± 83 radiocarbon years), then this is true of the two-sigma ranges of the dates in each cluster as well. We argue that the data reveal four important moments in the Pumapunku's history.

We evaluated two different historical scenarios that could account for the grouping shown in figure 11.6. In the first, the earliest cluster of samples would date the construction of the Pumapunku, the second cluster would date an episode of dismantling, the third would date a later episode of dismantling or perhaps refurbishing, and

Table 11.1. Radiocarbon dates from the Pumapunku

Lab Number	Provenience	Material	Context	Date (BP)	Calibrated Age (AD)	1σ Range (AD)	2σ Range (AD)
AA65279	C-29-14	Charcoal	Refuse concentration in exterior space adjacent to first revetment	302 ± 40	1566	1520–1647	1476–1661
AA68178	C-45-18	Carbonized wood	De facto refuse on floor inside Inca structure	315 ± 33	1563	1520–1641	1480–1649
AA65283	C-36-12	Charcoal	On surface of Inca patio	322 ± 54	1561	1495–1642	1451–1660
AA65278	C-29-12	Charcoal	Sediment accumulation in exterior space adjacent to first revetment	322 ± 55	1561	1495–1642	1451–1661
AA68181	C-29-18	Carbonized wood	Architectural debris	350 ± 31	1555	1481–1630	1457–1636
AA68182	C-27-13	Carbonized wood	Hearth on surface of Inca patio	356 ± 36	1547	1470–1629	1452–1635
AA68179	C-39-16	Carbonized wood	Secondary refuse concentration on floor inside Inca structure	362 ± 35	1536	1462–1625	1449–1635
AA68180	C-26-7	Carbonized straw	Burned roof fall on floor of Inca corridor	365 ± 31	1523	1457–1620	1448–1634
AA65286	M-3-3	Carbonized sediment	Refilled pit in front of first revetment	393 ± 35	1492	1446–1616	1438–1632
AA68184	M-3-3	Carbonized wood	Refilled pit in front of first revetment	1046 ± 33	995	976–1022	896–1031
AA68183	C-58-14	Carbonized wood	Disturbed dedicatory offering below second revetment	1241 ± 37	769	690–856	681–880
AA68185	C-54-36	Charcoal	Disturbed dedicatory offering in front of first revetment	1251 ± 36	750	685–805	675–870
AA65282	C-29-25	Charcoal	Disturbed dedicatory offering in pit in front of first revetment	1284 ± 40	727	674–771	656–860
AA65280	C-29-17	Charcoal	Architectural debris in pit in front of first revetment	1424 ± 83	613	541–677	430–771
OS-17860		Charcoal	Thin layer of blackened sediment on top of initial clay fill	1510 ± 25	563	542–593	437–618

the last would mark the Inca and Colonial reoccupation of the complex. In the second scenario, the earliest cluster of samples would date the initiation of the construction of the Pumapunku, and the second group of samples would date dedicatory events that occurred near the structure's completion. The third cluster of dates would represent the disturbance of those offerings, while the fourth would represent the Inca and Colonial occupation. We favor the first scenario for the reasons outlined below.

In both interpretations, the two dates in the earliest cluster date the construction of the Pumapunku. Sample OS-17860, from the layer of blackened earth at the top of the massive clay-fill layer that was laid down early in the Pumapunku's construction history, yielded a calibrated one-sigma range of AD 542–593 (AD 437–618). (All radiocarbon dates were calibrated using OxCal 4.0, and we give the one-sigma range, followed by the two-sigma range; see table 11.1). This date provides a firm anchor for the beginning of construction.

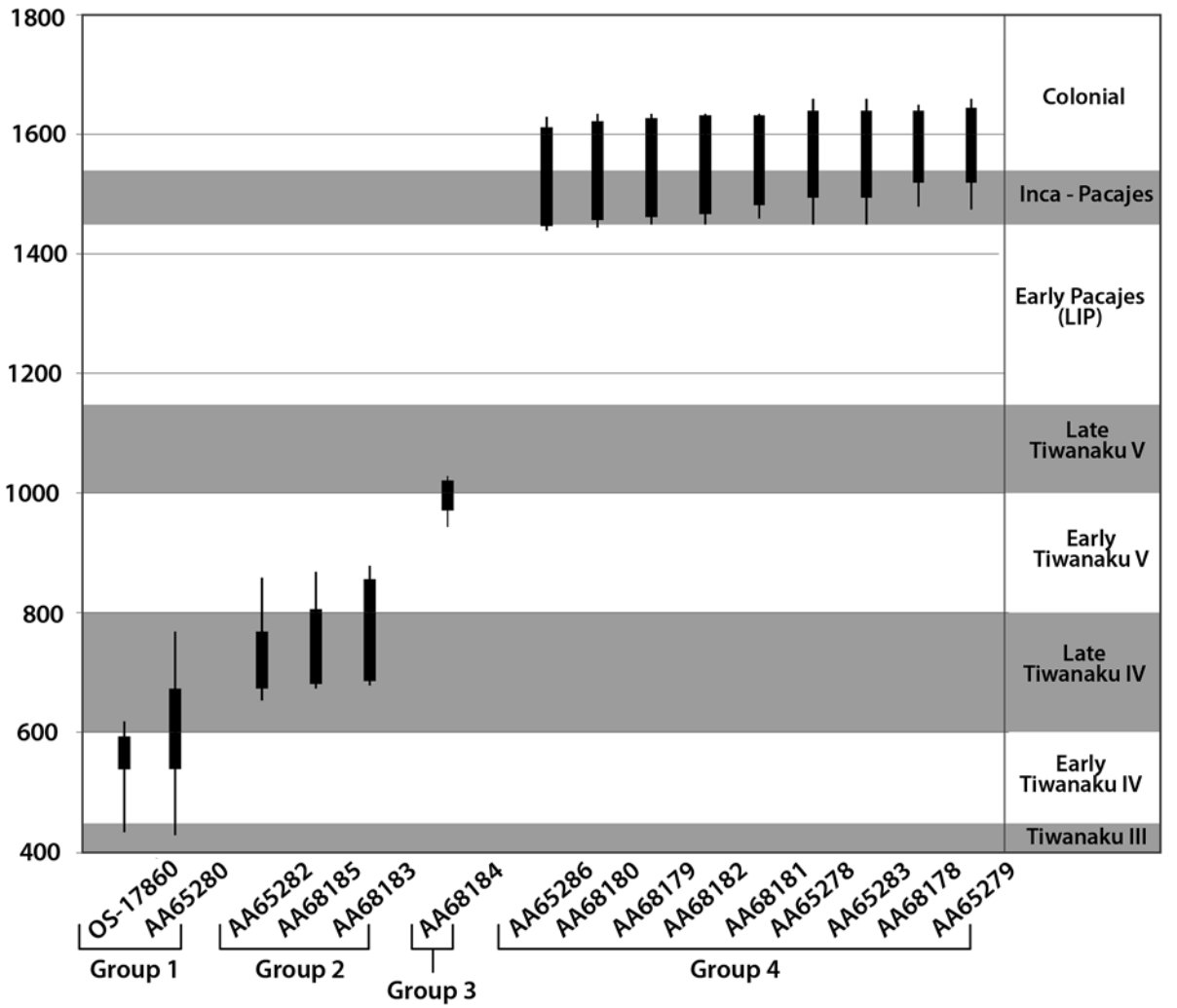

FIGURE 11.6 Radiocarbon dates from the Pumapunku. Vertical lines indicate two-sigma range; boxes indicate one-sigma range. *Ceramic phases from Janusek 2004a.*

The second date is more problematic. The date for this sample (AA65280) calibrates to AD 541–677 (AD 430–771), but the large standard deviation of 83 radiocarbon years yields very broad one- and two-sigma ranges. It derives from a piece of charcoal found in a heterogeneous layer with pieces of fire-hardened clay and silty clay matrix located adjacent to the pile of composite fill that was redeposited next to the Pumapunku's north face during the reopening of one of the offerings under the first revetment. We considered three possible origins for this charcoal: it could have been an inclusion in the composite fill, it could derive from the offering, or it could have been introduced during the activities associated with the reopening of the offerings.

The first two origins are most likely: the sample either dates the offering or the fill immediately around it. The principal reason for advancing these interpretations above the third is the date of the ceramic assemblage found associated with the disturbed offering. John Janusek's aforementioned assessment of the assemblage (personal communication, August 2008) was in effect a blind test, as he was unaware of the associated radiocarbon date. His conclusion that the assemblage dates to the early part of the Early Tiwanaku IV phase is consistent with the date yielded by this sample.

The second cluster of samples yielded three dates with calibrated ranges running from AD 674–771 to AD 690–856 (with two-sigma ranges extending from AD 656 to 880). These are all

associated with disturbed dedicatory offerings of the Pumapunku's north terraces. The two earlier dates (AA65282 and AA68185) are for charcoal samples found in the scattered remains of the disturbed offerings under the first revetment. The later date (AA68183) comes from a disturbed dedicatory offering of camelid remains associated with the Pumapunku's second revetment. A critical question is whether these three dates assay material associated with the original offerings or whether they assay materials associated with the disturbance.

Again, we evaluated multiple scenarios to determine the origin of this tightly spaced group of samples. They could either derive from the offerings placed at the time of the construction of the Pumapunku (whether burned at the time of deposition or when the offerings were reopened), or they could have their origins in the activities associated with the reentry. Two facts led us to accept the latter as the most parsimonious explanation. First, the first cluster of samples in figure 11.6 dates the construction of the Pumapunku to the late sixth and early seventh centuries AD. It is very unlikely that the builders of the Pumapunku tarried two centuries between laying down the early clay fill and placing the final revetments of the first version of the Main Platform. As noted earlier, the two lower offerings had to be put down at the same time as the first revetment. Second, as mentioned above, the ceramics that derived from the disturbed offering are Early Tiwanaku IV in date, a ceramic period that lies well outside the two-sigma ranges for any of these three dates.

Thus, we infer that this second cluster of samples dates the reentry of the offerings, probably sometime in the eighth century AD. This implies a significant transformation in the use of the Pumapunku and its role in Tiwanaku during the site's apogee as a regionally dominant center. It may also account for the fact that the Pumapunku was never finished (Vranich 1999, 2006).

The third cluster consists of a date from a single sample, a piece of carbonized wood from a refilled pit on the south side of the Pumapunku (AA68184). As argued above, this pit was probably excavated in a hunt for offerings like those removed earlier on the platform's north side. Although the evidence is not nearly as compelling as the case on the north side, the presence of camelid bones and well-preserved decorated sherds in the pit's fill suggests that the pit may have in fact located an offering. A piece of charcoal yielded a calibrated age range of AD 976–1022 (896–1031); the very tight two-sigma range suggests that this excavation took place several centuries after the reopening of the offerings on the north side, perhaps at a time when Tiwanaku's social and political orders were unraveling more rapidly (Janusek 2004a).

The final cluster of dates comes from Inca and Colonial contexts. Because the calibration curve flattens out somewhat in the sixteenth century, there is substantial overlap of these dates at both the one- and two-sigma ranges, rendering them all but contemporaneous. Nonetheless, the calibrated dates are ordered in the sequence we would expect, given the site's stratigraphy and the material culture associated with the samples, as discussed above. This group of dates supports the documentary and artifactual data that indicate that Tiwanaku was incorporated into the Inca realm in the mid- to late sixteenth century, and that the Pumapunku continued to be occupied into the early decades of the Colonial period.

A History of Tiwanaku's Monumental Architecture

The Pumapunku chronology just presented and the results of recent excavations and reassessments of other important structures in Tiwanaku allow us to offer a revised history of the site's monumental architecture. Based on its iconography, architectural form, and archaeoastronomical orientation, the Semisubterranean Temple is likely the earliest surviving monumental structure at Tiwanaku, dating perhaps as early as 200–300 BC (Benítez, chapter 8). The Semisubterranean Temple likely was followed by the Kalasasaya. In his reanalysis of the radiocarbon dates from the Kalasasaya and their stratigraphic contexts, Erik Marsh (2012) has argued that the Kalsasaya was begun during the Late Formative 1 period, around AD 100. Its construction required more labor and a greater level of organization than preceding public structures at the site, suggesting the increasing power of Tiwanaku's rulers.

Turning to the ideology that underwrote Tiwanaku's political organization, the Kalasasaya also marked a change in ritual architecture from sunken temples that were aligned to the south and keyed to celestial movements in the nighttime sky, to raised platforms aligned east–west that referenced the passage of the sun and sacred mountains (Benítez, chapter 8; Janusek 2006). The construction of the Kalasasaya during Late Formative 1 corresponds roughly with the apparent nucleation of population in the Tiwanaku valley (Mathews 2003, 117) and the expansion of Tiwanaku influence to adjacent areas like the Taraco Peninsula and the Katari valley (Bandy 2001; Ponce Sanginés 1981; Stanish 2003). Occupation and construction continued in the Late Formative 2 period (Knobloch, forthcoming).

The construction of monumental platforms continued into the Tiwanaku IV period. The radiocarbon and ceramic analyses presented above indicate that the initial construction of the Pumapunku dates to the sixth century AD, in the Early Tiwanaku IV period. The Pumapunku shares with the Kalasasaya an east–west alignment, though not strictly cardinal; a relatively low silhouette; and a visual connection to a sacred peak, the Illimani, in this case. It adds a central sunken court, however, thus bringing together the architectural features of the Semisubterranean Temple and the Kalasasaya into one monumental structure.

Dating the Akapana's construction is more challenging. This is the largest building at Tiwanaku, a massive platform in the shape of one-half of an Andean cross, measuring some 194 by 182 m and rising 18 m in seven double-walled terraces (Manzanilla 1992; Vranich 2001). Deep soundings conducted by DINAR found no earlier construction episodes, suggesting that most of the pyramid's great bulk derives from one construction project.

Radiocarbon dates collected by Proyecto Wila Jawira (Janusek 2003b, table 3.1) and shown as Group 1 in figure 11.7 allow us to propose a date for this construction. Three of these samples derive from contexts associated with the Akapana's first terrace. Feature 2, a deposit of smashed vessels, predominantly keros, was found associated with human and animal bone (Alconini Mújica 1995; Kolata 1993; Manzanilla 1992). The kero smash can be dated by two radiocarbon samples, SMU-2293 (AD 542–774 [AD 414–892]) and SMU-2285 (AD 400–864 [AD 136–1017]). A human cranium in feature 17 found in the same excavation unit as SMU-2293 (Janusek 2003b, table 3.1) is associated with radiocarbon sample ETH-6306 (AD 555–647 [AD 434–666]).

Feature 2 and associated deposits have been proposed as evidence of ceremonial activities emphasizing military prowess, marking the transformation of the pyramid from an earth shrine that served as the site's primary temple into a monument celebrating its elite ruling lineages (Kolata 1993, 2003c, 190–92). A reevaluation of the architectural and archaeological context of these deposits, however, has demonstrated that they were placed along the front of the interior wall of the double-walled terrace construction, probably in ceremonies associated with the construction of the terrace's fine finished outer facade. Consequently, according to Vranich (2001), they date the construction of that part of the Akapana. Although many of the radiocarbon dates have large standard deviations, the available samples point to a date in the late sixth century or first half of the seventh century AD.

This dating appears to be confirmed by another sample. On the Akapana's summit, 2 m northwest of a stone drainage canal, Manzanilla (1992, 42–45, fig. 13; also Kolata 2003c, fig. 7.10) found human remains. Their location vis-à-vis the drainage canal suggests that they were deposited in the platform's uppermost fill layers. An associated radiocarbon date, SMU-2468 (AD 605–669 [AD 559–765]) is also consistent with a late sixth or early seventh century AD construction date. Taken together, the dates we have placed in Group 1 suggest that the main bulk of the Akapana and the final facades of its terraces were completed during the first half of the seventh century AD, quite likely over the course of years or decades.

More dates are clearly needed, especially given the large standard deviations of many of the dates currently available. But these data lead us to suggest that the Akapana's construction postdates the construction of the Pumapunku, perhaps only by fifty years. There also is clear evidence that the Akapana was built within the context of an already

established monumental center. Its terraces were constructed using recycled stone removed from buildings that apparently were dismantled at this time, including stones that probably derive from dismantled segments of the Kalasasaya.

The Akapana's construction signals an important change in Tiwanaku's monumental landscape, as it occluded the long-standing southern viewshed of the Semisubterranean Temple. Since the Formative period, the orthostats on either side of the temple's stairway had framed the Cerro Quimsachata and the southern pole, such that the stars rotated through the night sky around a point directly over the highest peak of the Quimsachata range. Lending weight to Kolata's (1993) arguments that the Akapana was built to replicate the Cerro Quimsachata, the mass of the Akapana blocked the view of the Cerro Quimsachata while simultaneously standing in for that sacred peak, as the southern pole was now located directly above its summit (Benítez, chapter 8).

The next major change in the site's form and design was an extensive period of construction identified by Kolata (2003c, 194; also Janusek 2003b), which apparently occurred sometime around the transition from Late Tiwanaku IV to Early Tiwanaku V. Nicole Couture (Couture and Sampek 2003, 245, 261) has presented a close and convincing analysis of the stratigraphy, ceramic assemblages, and radiocarbon dates recovered in the area of the Putuni, demonstrating that residential complexes near the Akapana to the east of the Kalasasaya were razed to make way for the Putuni and associated structures near the end of Late Tiwanaku IV, in the second half of the eighth century AD. It was probably around this same time that the plaza areas east of the Semisubterranean Temple and the Akapana were resurfaced with a pebble surface, increasing the capacity of the gathering areas surrounding these important structures.

By the time of this site-wide transformation, the Pumapunku had already reached its ultimate form, but it was never fully finished. The final evidence of Middle Horizon activities at the Pumapunku dates to sometime around the end of the eighth century AD, suggesting that the pyramid may have fallen into disuse relatively early in the site's history. In contrast, the Akapana seems to have been used much later, as evidenced by a second set of contexts. Shown as Group 2 in figure 11.7, they include three sets of disarticulated remains (features 16, 8a, and 12; Alconini Mújica 1995; Blom, Janusek, and Buikstra 2003; Manzanilla 1992) and one articulated dog skeleton (feature 13; Janusek 2003b; Kolata 1993, 2003c), all recovered along the front of the revetment of the first terrace on the pyramid's west side. These remains were buried in a matrix that gradually accumulated during the use of the pyramid (Vranich 2001). Each feature has an associated radiocarbon date: SMU-2329 (AD 422–870 [AD 137–1025]), ETH-5640 (AD 777–963 [AD 689–990]), SMU-2367 (AD 780–972 [AD 689–1018]), and SMU-2330 (AD 780–1037 [AD 688–1166]), respectively (also listed in Janusek 2003b; calibrated using OxCal 4.0). The range of radiocarbon dates suggests one or more depositional events (Kolata 2003c) sometime between the late eighth through tenth centuries AD, broadly consistent with the few Tiwanaku IV keros associated with feature 8a (Manzanilla 1992, 71, 74). If one excludes SMU-2329 because of its exceedingly large standard deviation, these events are more likely to have occurred in the ninth and tenth centuries AD.

Two other samples from other parts of the Akapana provide similar dates. One, ETH-5639 (AD 777–950 [AD 691–989]), was found associated with human remains (feature 11) on the Akapana's first terrace near features 2 and 17, discussed above. Its date is consistent with this second group of contexts, but its stratigraphic positioning remains unclear. The second sample, SMU-2336 (AD 670–887 [AD 609–1015]), derives from feature 19 on the Akapana's summit and provides a date more consistent with the use-related samples discussed above.

Kolata (1993, 2003c) and Blom, Janusek, and Buikstra (2003) have argued that these features represent the redeposition of disinterred skeletons or mummies and their associated objects. We agree with this general interpretation but believe these events occurred well after the construction activities described above, contra Kolata's suggestion that both groups of deposits could be the product of a single ritual event (Kolata 2003c, 191). In fact, these disinterred skeletons could represent the disturbance of dedicatory offerings

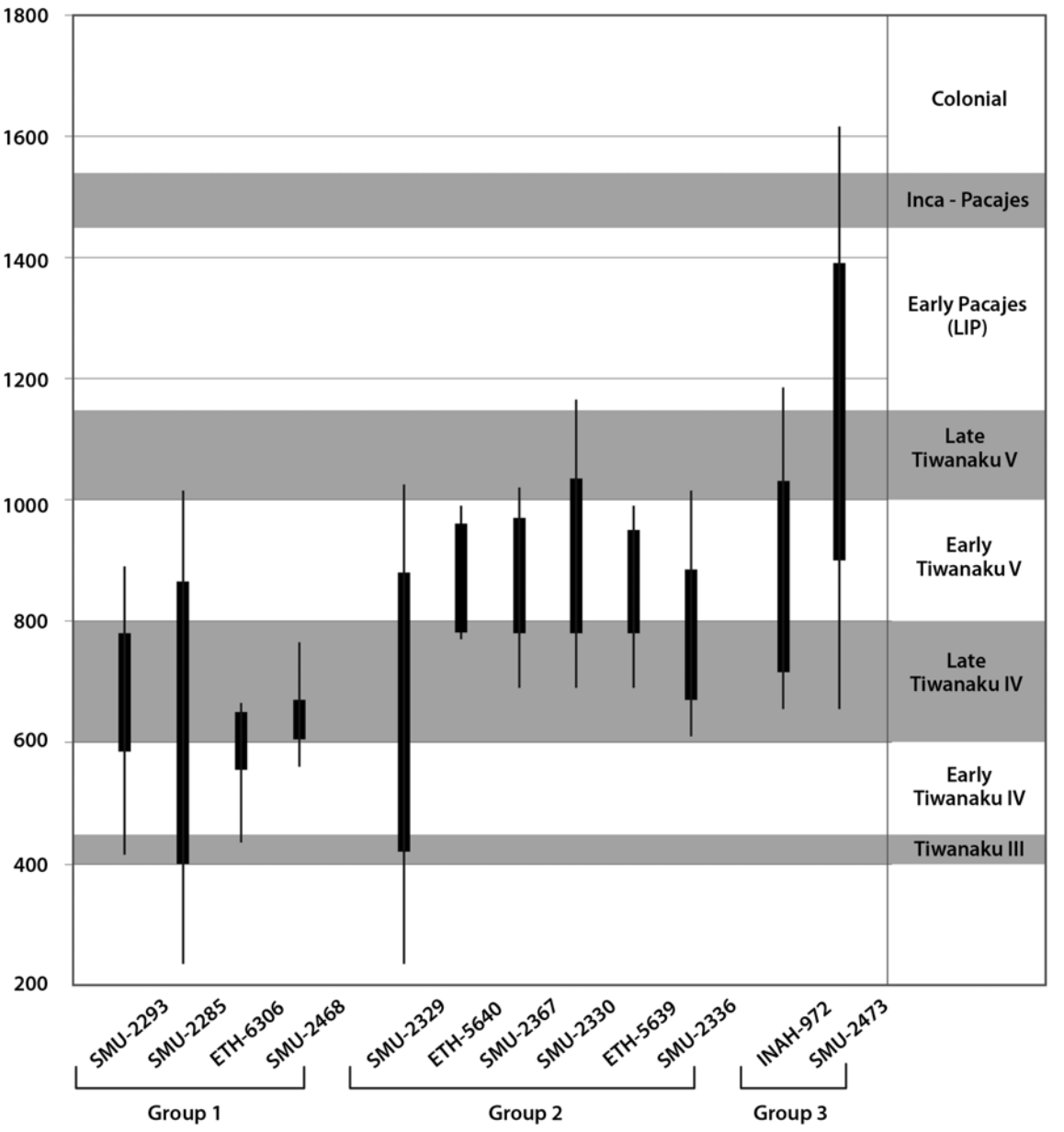

FIGURE 11.7 Radiocarbon dates from the Akapana. Vertical lines indicate two-sigma range; boxes indicate one-sigma range. *Dates from Manzanilla 1992 and Janusek 2003b; ceramic phases from Janusek 2004a.*

in the Akapana itself, akin to those we have documented at the Pumapunku. If so, their disinterment could mark a shift in ritual focus away from the Akapana to other structures, perhaps the Putuni (Couture and Sampeck 2003).

It is difficult to date the end of monumental construction at Tiwanaku, but it likely occurred well before the tenth century AD. The latest signs of Middle Horizon use of the Pumapunku contain ceramics suggesting a date around the Late Tiwanaku IV/Early Tiwanaku V transition, perhaps in the ninth century AD. The Putuni and associated palace complex show a strong Tiwanaku V occupation (Couture and Sampeck 2003), although the date of their abandonment remains unknown. On the Akapana, in the complex of rooms on the northeast corner of its summit, Manzanilla (1992, fig. 25) recovered an on-floor deposit of llama remains, smashed elaborate vessels, and other valuables that yielded two radiocarbon dates, one from

the northeast corner (INAH-972; AD 716–1028 [AD 652–1185]; Manzanilla 1992; Ríos Paredes 1991), and the other from the southeast corner (SMU-2473; AD 900–1392 [AD 654–1615]; Janusek 2003b). Manzanilla (1992) makes the intriguing proposal that this offering could represent a termination or closure ritual of this complex (see also Kolata 2003c, 189). Regardless of the exact reasons that motivated the deposition, these two dates suggest that these rooms fell into disuse sometime between the tenth and twelfth centuries AD.

Despite the decline of Tiwanaku, the site continued to be occupied by a reduced population living in more modest residences (Janusek and Kolata 2003). Although no longer the seat of a powerful polity, Tiwanaku as a place and symbol had long-term reverberations in the Andes. Various elements of Tiwanaku's art, architecture, material culture, and iconography continued to circulate, being revived by the Inca empire in the fifteenth century (Demarest 1981; Protzen and Nair 1997; Zuidema 1990). An Inca creation narrative touted Tiwanaku as the place of creation (Albornoz (1581–85) 1989; Betanzos [1551–57] 1987; Cieza de León [1553] 1959), placing the site at the end of one of the most important *ceque* lines radiating out from Cuzco (Zuidema 1990). As befits such an important place, a significant Inca settlement was established at Tiwanaku (Yaeger and López Bejarano 2004), as we discussed above.

DISCUSSION AND CONCLUSIONS

The revised history of monumental construction that we have presented here has several larger implications for understanding Tiwanaku and its role in the south-central Andes. First, the histories of the Pumapunku and Tiwanaku's other monumental structures as presented here and elsewhere in this volume dispel any notion that the development of the monumental core of Tiwanaku represents the progressive fulfillment of a preconceived urban plan. Tiwanaku grew like most complex sites with long occupations, through a series of architectural choices shaped by changing political conditions, shifting cultural norms, and environmental changes. The site maintained a semblance of order from the Formative period to the end of the Middle Horizon, as both residences and monuments were oriented toward the peak of the Cerro Quimsachata, directly under the southern pole. Each monumental structure has its own history, however, and some structures reached their culmination at a time when others languished in various degrees of decay and collapse (Couture and Sampeck 2003; Isbell and Vranich 2004; Janusek 1994).

Within this long history, it is now clear that although the Pumapunku's stonework is arguably the finest at Tiwanaku (Protzen and Nair 2013), it does not represent the culmination of a masonry and engineering tradition that grew progressively more sophisticated over time, nor was it built during the site's apogee. Instead, the platform was planned and initiated during a period when the rulers of Tiwanaku, the largest settlement in the southern Titicaca Basin, sought to extend their influence across the region. If one accepts that the Pumapunku was built as a gateway into the site for people coming from the west—the direction of Lake Titicaca—it would bolster claims that the rulers sought to establish or emphasize the site's role as a pilgrimage center (Reinhard 1985, 1991; Vranich 1999). That said, if the *chachapumas* holding trophy heads on the Pumapunku were contemporaneous with its construction, then militarism was present at Tiwanaku prior to the construction of the Akapana and may have been an important component of its leaders' political strategies.

One important observation we wish to make about the Pumapunku and the Akapana is that each was primarily built in a single construction episode with later, relatively minor modifications. Neither the Pumapunku nor the Akapana contains smaller versions within, in contrast to most platforms and pyramids of the North Coast of Peru and Mesoamerica. Their basic form and size were determined at the time that construction was initiated, and they required a substantial investment of effort before they could be used, even in an unfinished state. The planners and sponsors must have decided and believed that they would have enough resources and labor to complete these ambitious projects. However, as is the case in many large public works projects, an ambitious initial trajectory often bends to accommodate the

pragmatic realities of politics and logistics, and the end product is a reduced version of the original idea. At Tiwanaku, some buildings, such as the Pumapunku, were never finished. Careful routing of visitors presented the platform's best facade, while temporary constructions hid incomplete faces and construction work in progress (Isbell and Vranich 2004; Vranich 2006, 2009).

The new chronology we present here also undermines the sociopolitical reading of the relationship between the Pumapunku and Akapana platforms that views them as shrines for low- and high-ranking moieties, respectively (Kolata 1993, 2003c, 183). Their construction and use histories are not contemporaneous, and the Pumapunku—the putative shrine of the low-ranking moiety—was built first. Although a structuralist analysis of principles of dualism in the iconography and architecture of Tiwanaku's monumental structures and monoliths has yielded important results and insights into the cosmology and politics of ancient Tiwanaku (Kolata 1993), they are not as productive in this particular case.

We further question the theory that the Akapana's meaning as an earth shrine, symbolically linked to mountains, water, and fertility, may have shifted fundamentally sometime around the transition from Late Tiwanaku IV to Early Tiwanaku V, having been appropriated by Tiwanaku's ruling elite, who commissioned art and undertook rituals with strong militaristic themes that legitimated their authority. Our reconstruction repositions martial themes as being integral to the pyramid's symbolism and political efficacy from its very foundation, rather than indications of the structure's symbolic reformulation.

The chronology presented here also has implications for the abandonment of Tiwanaku and its collapse. Although dating the abandonment of Tiwanaku's individual structures is difficult, the data do strongly suggest that the Pumapunku, at least, was abandoned well before the Akapana. We suspect that as more chronological data are collected and published for Tiwanaku's monumental structures and residential sectors, we will find that Tiwanaku's Middle Horizon history is characterized by more gradual or episodic abandonment of various sectors of the site, not rapid, cataclysmic collapse.

Regardless of its pacing, this collapse clearly did not spell the end of the site's history and occupation, given the strong evidence of a robust Inca settlement at the site, particularly around the Pumapunku. The radiocarbon dates and artifact assemblage from that sector of the Inca settlement demonstrate that it was occupied during the later decades of the pre-Columbian era and into the Colonial period. It is interesting that we lack any anomalously old radiocarbon dates associated with Inca ceramics like those reported by Pärssinen and Siiriäinen (1997) at Caquiaviri. As those authors suggest, those early dates may indicate that trade of Inca ceramics extended beyond the formal boundaries of the Inca empire. Given that we found no significant Late Intermediate period occupation of the Pumapunku, we would not expect to find evidence of that putative trade.

The abundance of contexts dating to the final decades of the Inca empire and the continuity of occupation into the Colonial period also argue against Martti Pärssinen's (2002, 2003) hypothesis that the Inca moved their facilities from Tiwanaku to Copacabana following the Collao rebellion, leaving the buildings to crumble into ruins. He bases his conclusion on the fact that Pedro de Cieza de León's early description of the Inca settlement at Tiwanaku mentions its ruined state, describes only a few buildings, and omits any mention of an *acllawasi*, coupled with the fact that there is no documentary evidence of resettled Cuzco *ayllus* at the site. These lines of largely negative evidence seem weak in light of the archaeological evidence of a large Inca settlement at Tiwanaku (A. Smith 2002) and the scale of Inca modifications of the Pumapunku (Yaeger and López Bejarano 2004). Pärssinen (2002, 2003) suggests that many Colonial authors who discussed Tiwanaku's role as an important political and religious center were actually referring to Copacabana, but we disagree strongly. The discovery of a significant Inca settlement at Tiwanaku, with evidence of continuous occupation from the Late Horizon to the Colonial period, strongly suggests that Colonial documents naming Tiwanaku in fact referred to that site, not Copacabana.

The rich and complex architectural and political history of Tiwanaku did not end with the

collapse of the Classic Tiwanaku polity, nor with the fall of the Inca empire. It extended through the Inca empire and continues today, as people reinterpret and remake the architectural fabric of Tiwanaku, ancient and modern, in light of contemporary social and political contexts.

ACKNOWLEDGMENTS

We would like to thank the personnel of the Dirección Nacional de Arqueología (DINAR) in Bolivia for the support they provided to the Proyecto Arqueológico Pumapunku–Akapana, with special thanks to its Director Lic. Javier Escalante, and to Eduardo Pareja and Freddy Arce, and to the Director of the Museo Nacional de Arqueología, Lic. César Velázquez. We would also like to thank the Alcaldía and the Junta de Vecinos of Tiahuanaco and the Mallkus of the Central Agraria, who represent the communities surrounding Tiahuanaco. Our research owes a great deal to the Asociación de Trabajadores en Arqueología deTiwanaku (ASTAT), the labor union of archaeological field personnel, which brought tremendous expertise and professionalism to our excavations. We also recognize all of the other members of PAPA, especially co-director José López Bejarano and Marcelo Maldonado Vargas. Our excavations and analyses were funded by grants from the National Science Foundation, the National Geographic Society, the H. John Heinz III Fund for Latin American Archaeology, and the Graduate School and Vilas Foundation of the University of Wisconsin. The University of Arizona carried out the radiocarbon dating, with generous support from the National Science Foundation. Finally, we thank the editors and anonymous reviewers for their remarks, which helped us improve and clarify our arguments. We are solely responsible for any errors in fact or interpretation that remain.

Chapter 12

Reexamining Tiwanaku's Urban Renewal through Ground-Penetrating Radar and Excavation: The Results of Three Field Seasons

Michele L. Koons

Introduction

During the 2002, 2004, and 2005 field seasons, over 100,000 m^2 of ground-penetrating radar (GPR) data were collected to understand the spatial layout and arrangement of architectural features within the monumental core of Tiwanaku (fig. 12.1). The major objective of this survey was to better understand the architectural transition and reorganization that occurred around AD 800, which roughly correlates with the ceramic transition from Tiwanaku IV to Tiwanaku V. Since GPR data are collected in three dimensions, the relative depths of structures and features can be stratigraphically correlated to different construction sequences at the site. Based on significant reflections in the GPR data, excavations were placed in numerous locations around the site. By incorporating excavations and GPR data, we can project information from a series of strategically placed units across a larger area with great spatial precision. Using this method, numerous structures have been identified and partially excavated within the monumental core. Many of these structures are related to the construction phases before and after the architectural transition that occurred around the ninth century AD. This chapter will outline the methodology employed in the location of these excavations, their archaeological yields, and interpretations.

Background

Between AD 500 and 1050, Tiwanaku emerged as the primary ceremonial, political, and economic center in the southern Andes (Browman 1978, 327; Couture 2002, xvii; Janusek 2004b). Situated approximately 15 km southeast of Lake Titicaca in highland Bolivia, at its apex (~ AD 800–1000) Tiwanaku's influence stretched as far west as the Chilean and Peruvian coasts and into the eastern Amazon rain forest (Browman 1978, 331; Couture 2002, 32). The central core of Tiwanaku was the main trade hub for the region and consisted of monumental architecture that was expanded, rebuilt, and reintegrated over time while the dynamics and organization of the city morphed and changed.

During the Late Formative period (250 BC–AD 500), Tiwanaku was likely similar to other settlements in the Titicaca Basin that were characterized by sunken court architecture (Hastorf 2005; Janusek 2004b, 109). By roughly AD 500 it had become the largest center in the region, consisting of the imposing Akapana, the Kalasasaya, and the Semisubterranean Temple (fig. 12.1). Residential compounds stood around the major monuments. The varying and distinct material assemblages found within these compounds have led scholars to contend that they were associated with specific *ayllus*, or kinship groups, from different communities

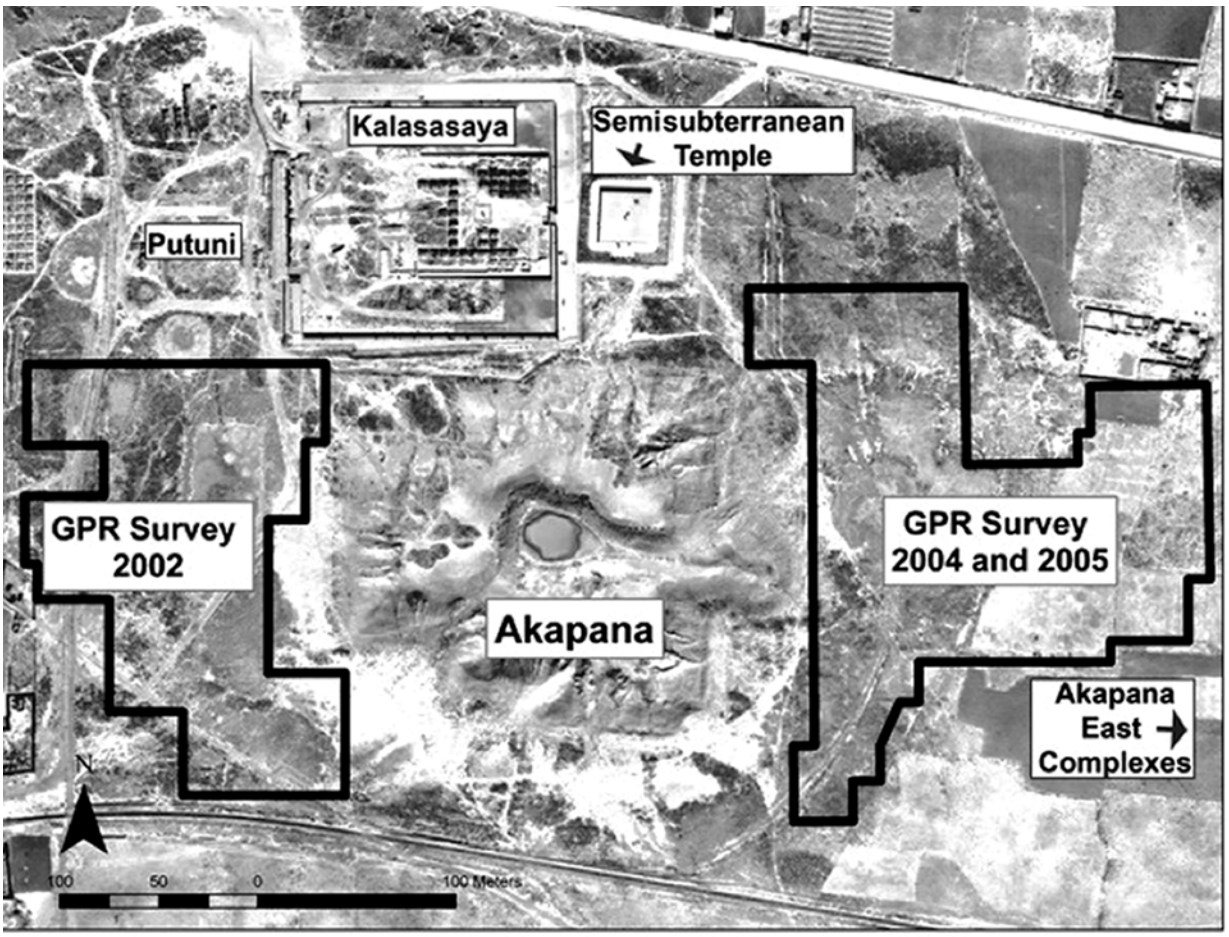

FIGURE 12.1 The 2002, 2004, and 2005 GPR survey areas overlaid on an aerial photograph of the monumental core of Tiwanaku and highlighting the major monuments.

throughout the Tiwanaku sphere of influence (Couture 2002; Janusek 2003a, 2004b; Kolata 2003c). The ayllu system is a dynamic alliance of real and fictive kin that worship a common ancestor and sacred places in a landscape. It is well documented for the Inca period and today, but is thought to have deeper temporal roots. Traditionally, people of one ayllu owned land in different geographical regions so that the members of that ayllu had access to multiple resources (Albarracín-Jordán 2003, 96). Therefore, the compounds at Tiwanaku would have served ayllu members not only residing at the site but also from various hamlets and villages across the Tiwanaku sphere of influence.

In addition to containing diverse material culture, the Tiwanaku IV residential compounds, or *barrios*, were constantly renovated over the period of at least three centuries leading up to a major architectural reorganization around AD 800. This transition is also marked by a change in vessel forms and iconography between Tiwanaku IV and Tiwanaku V ceramics found throughout the site (Janusek 2003b).

Around AD 800 the Tiwanaku IV compounds were razed and new, more elaborate structures with restrictive architecture were built, such as the Putuni complex and the final phases of the Akapana East complexes (fig. 12.1) (Couture 2002; Janusek 2003a). It has been suggested that the architectural transformation occurred because competition between ayllu members residing within these compounds increased as Tiwanaku influence expanded over the region. This shift in architecture has been interpreted as a move toward a more exclusive and elite-centric settlement (Couture 2002).

The research I present here, however, may suggest a different pattern. Based on large-scale GPR surveys and excavations, in some areas structures were razed and not rebuilt. Rather, they were cleared to make room for more public space during Tiwanaku V. This increase in public space corresponds with the height of Tiwanaku influence throughout the region and could be a response to an increase in the number of pilgrims traveling to the important ceremonial center. Below I present evidence suggesting that the monumental core of Tiwanaku was changing in a way that was able to accommodate more people. I contend that the grander architecture was a symbol of the increasing importance of the demonstration of wealth and prestige among the competing ayllu groups, but not necessarily a symbol of elite exclusivity.

GPR AT TIWANAKU

GPR is a near-surface, remote-sensing technique capable of subsurface three-dimensional imaging (Conyers 2004). This method is used to spatially map subsurface features, such as middens, and an array of architectural features, such as walls and floors. The basic GPR method involves one antenna transmitting energy into the ground and another antenna receiving electromagnetic radar pulses reflected from buried objects or disturbances in the subsurface. For this project, radar data were collected in equally spaced straight transect lines within rectilinear grids. As radar energy moves through the ground, the velocity of the waves will change depending on the electric, and to some extent, the magnetic, properties of the materials through which they pass. A greater contrast in the electric and magnetic properties between two materials results in a stronger reflection, and therefore greater amplitude, of the reflected waves. A large number of subsurface reflections are collected along each transect line in a grid. These reflections are collected in time (nanoseconds [ns]), which can later be converted into depth after determining the velocity of the energy traveling through the ground (Conyers and Lucius 1996).

The depth to which radar energy can penetrate is partially controlled by the frequency of the antenna. A lower-frequency antenna (in the 100 megahertz [MHz] range) produces longer wavelengths that can potentially penetrate deeper into the ground, sometimes up to 50 m in favorable conditions. A higher-frequency antenna (in the 900 MHz range), however, will be able to penetrate less than 1 m in most conditions, but with a far higher resolution than a lower-frequency antenna. A trade-off therefore exists between depth of penetration and resolution. More influential to the success of using GPR are the soil and sediment mineralogy, ground moisture, and topography. Electrically conductive or magnetic materials will absorb radar energy very quickly and prevent its transmission to depth, regardless of the frequency of antenna. In this project, sediments were primarily dry, and the ground surface was cleared of vegetation and other obstacles. We were able to maintain consistent contact between the antenna and the ground surface, producing excellent energy propagation and resolution up to about 1.5 m using a 400 MHz antenna.

The ability to measure distance in the ground is one of the most powerful aspects of GPR. When all transects collected within a grid are vertically aligned, they can be processed to yield amplitude slice maps, which are three-dimensional maps that show the differences in reflected amplitudes across a given surface at various depths. Archaeological features are more readily apparent, and their spatial arrangement is more easily identified.

2002 RESEARCH

In 2002, Kimberly Henderson of the University of Denver collected a large radar grid measuring 220 m north–south by 160 m east–west, to the west of the Akapana and directly south of the Putuni complex (fig. 12.1). Prior to Henderson's GPR survey, scholars had hypothesized that the area to the west of the Akapana was the focal point of the urban landscape and the center of social, cultural, and political activity during Tiwanaku IV and V (Janusek 2004b; Kolata 1993, 2003c). As noted above, an architectural change occurred around AD 800, where earlier buildings were dismantled and destroyed to accommodate the construction of new buildings and plazas. This change in architecture reflects a shift in the dynamics and social organization of the city

around the eighth century (Couture 2002; Janusek 2004b; J. Moore 1996b). Henderson (2004, 81) positioned the GPR grid in 2002 to test whether or not this architectural shift could be detected in distinct stratigraphic layers of subsurface remains in the GPR reflection profiles and amplitude slice maps. Overall, her goals were to understand what architectural and social changes took place during the transition from Tiwanaku IV to Tiwanaku V and to see if these changes could be detected with GPR and small-scale excavations (Henderson 2004).

The results of Henderson's GPR survey showed multiple structures and areas of interest, including a rectangular 40 by 50 m structure, a possible plaza area, and a structure in the southern sector of the survey area. Based on the architecture apparent in the amplitude slice maps and limited excavations (four 3 by 2 m units [L1–L4]), Henderson concluded that her amplitude slice map 3 (6–9 ns, or 30–45 cm below the surface) contained features and structures related to Tiwanaku V, and that amplitude slice map 5 (12–15 ns, or 60–75 cm below the surface) represented subsurface features from Tiwanaku IV (fig. 12.2) (Henderson 2004).

2004 AND 2005 EXCAVATIONS OF THE WEST SIDE OF THE AKAPANA

Based on Henderson's processed and interpreted data from 2002, in 2004 and 2005 I placed an additional eighteen excavation units on the west side of the Akapana. These units ranged from 5 by 5 m to 3 by 2 m and concentrated on three main sections of the survey area. First, excavations were located to investigate a possible plaza area located in the center of the grid where no significant radar reflections were recorded. Second, units were located in the northern portion of the survey area in and around the 40 by 50 m rectangular structure. Finally, excavations were placed in

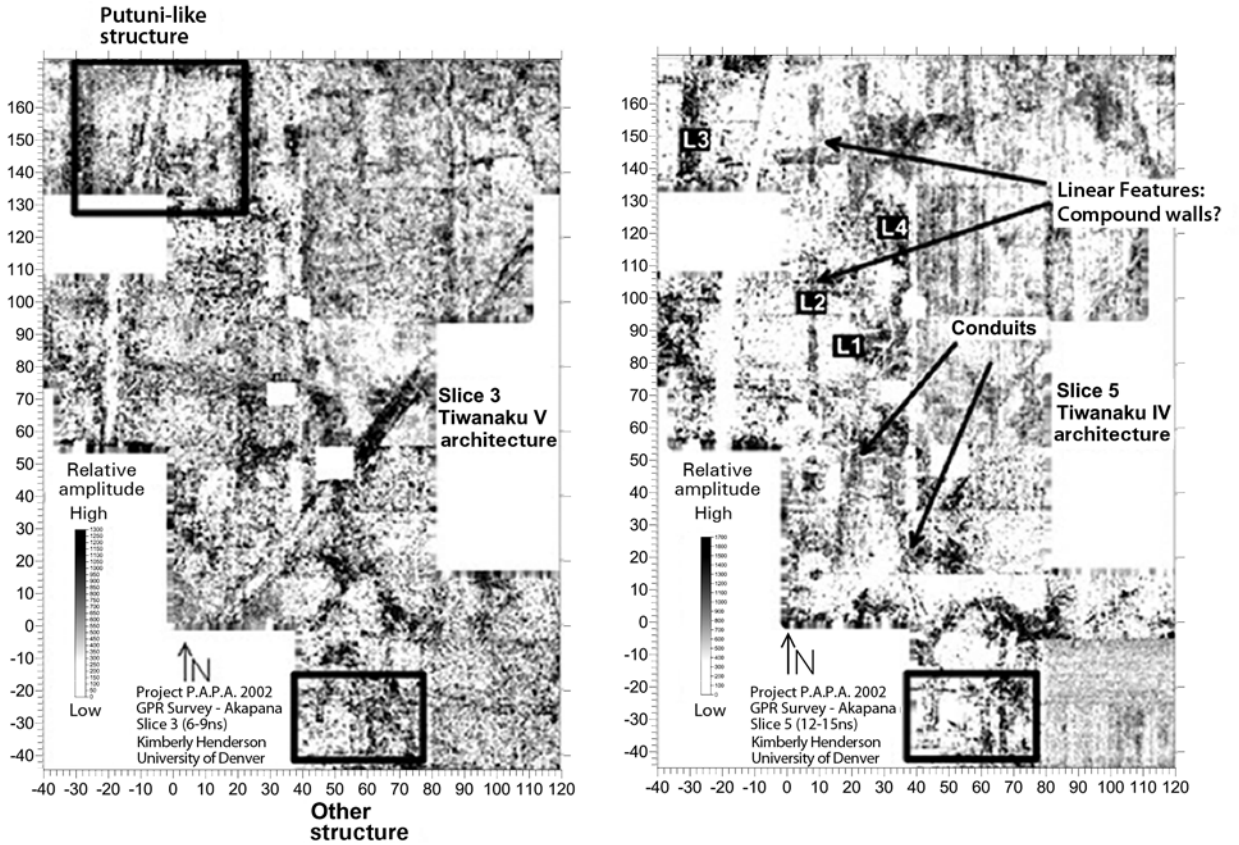

FIGURE 12.2 Henderson's slice 3 (*left*) and 5 (*right*) GPR maps annotated to highlight the architectural features of interest from Tiwanaku IV and V. Slice 5 shows Henderson's excavation units (L1–L4).

the southern part of the survey area where a smaller structure was identified in the amplitude slice maps (fig. 12.2).

EXCAVATIONS TO THE WEST OF THE AKAPANA

The center of the 2002 GPR grid (fig. 12.2) shows an absence of significant radar reflections. Aerial photography of the site shows that this area is a rectangular depression where water collects during the wet season, and both Henderson and I hypothesized that this was possibly a plaza (fig. 12.3). Reasons for the lack of strong GPR reflections within this area may be due to a high clay content and moisture level, which increase signal attenuation. Three 3 by 2 m excavation units were placed around the perimeter of the depression to see if a subsurface material change that was not readily apparent in the GPR maps could be detected to suggest the presence of a plaza.

In unit L5 we found a post-contact-period wall lining the depression's eastern limits (fig. 12.3). Units L6 and L7 were placed to see if a floor surface could be identified, even though this feature was not readily identified in the GPR maps. Excavations revealed a gravel surface, which we identified as a floor. This floor had dense cultural deposits, including human bones, camelid bones, and ceramics, and was about 40 cm below the surface in L6, and 55 cm below the surface in L5. The floor and associated ceramics and bones from both of the units have been tentatively dated to Tiwanaku IV. It is important to note that this gravel floor was not continuous across an entire level of L6; rather it was apparent in patches. Unit L7, although lacking the same gravel floor or the same density of faunal and ceramic material, did contain the remains of a looted burial and some utilitarian pottery. Since this burial was obviously disturbed and deeper than the gravel floor (about 110 cm below the surface), it is possible that if a floor did exist in the layers above the interment, it would have been destroyed when the burial was looted.

The gravel surface to the west of the Akapana could be representative of a once-open area. Henderson (2004) described a gravel layer in unit L4, which was within the same general area as L6 and L7. However, the gravel stratum she identified was roughly 20 cm below the floor found in L6, which may suggest that rather than one continuous plaza surface, there were multiple surfaces at different levels. Excavations to the north of the hypothesized plaza area further support this claim and will be discussed below. Although no plaza was definitively identified, there were various gravel layers found that suggest that this area west of the Akapana was reused and renewed multiple times over the length of the occupation during Tiwanaku IV and V. The artifact-laden surfaces are sharply contrasted with a very clean, artifact-free gravel floor found on the east side of the Akapana, as will be described below.

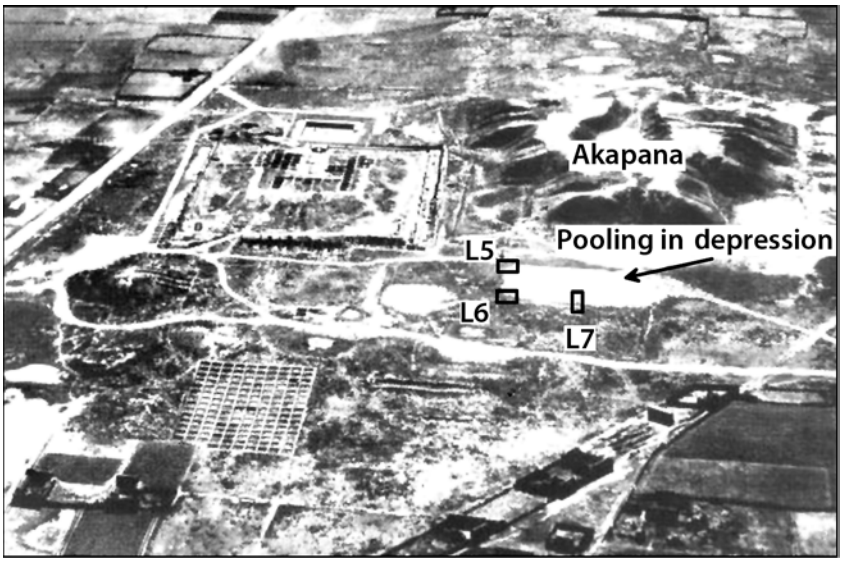

FIGURE 12.3 Hypothesized plaza area on the west side of the Akapana, and the approximate locations of excavations L5 through L7. This photograph was taken during the rainy season, and water has accumulated inside the rectangular depression.

EXCAVATIONS IN THE NORTHERN SECTOR WEST OF THE AKAPANA

A total of eight excavation units were placed just to the north of the excavations in the plaza area (fig. 12.4). Three of the excavations focused on the east wall of the rectangular 40 by 50 m structure visible in the GPR image (L9, L11, and L13). One unit was located inside the structure (L10), and four were placed to the east of the structure in other areas with significant GPR reflections (L8, L14, L23, and L24). I hypothesized that this rectangular structure, like the Kalasasaya and the Putuni, also had an entrance facing east. In the GPR reflection profiles (fig. 12.5), I noted in a planar reflection what could be in situ architecture. Units L9 and L11 were placed to investigate the source of this reflection and to see if the entrance to the structure could be identified. In L9 and L11 we found a flagstone pavement and foundation wall (fig. 12.6) that related to the planar reflection within the GPR reflection profiles. Only a 2 m stretch of the foundation stones were in situ. The foundation stones contained basal moldings that indicate that they once supported a masonry superstructure (Skidmore and Yates 2005).

To the east of the foundation was a red, silty sand construction fill with several set cut stones. Henderson found this same type of fill in unit L3, which investigated the western wall of the same structure (fig. 12.2). The same fill has also been explained by both Vranich (1999), in the case of the Pumapunku, and by Couture and Sampeck (2003), for the Putuni complex. The presence of this construction fill suggests that this was a platform structure with an interior court similar to the Putuni. Given this, I refer to the structure as the Putuni 2, or P2.

To the west of the foundation wall within L9 was a gravel floor composed of small and medium-size greenish gray pebbles. This gravel floor was capped with red clay similar to the aggregate that supported the walls of the Putuni (Couture 2002, 249). Abutting the gravel aggregate surface, directly to the south of the southernmost in situ foundation stone, was a flagstone pavement (fig. 12.6). This pavement was made up of cut andesite stones fitted together to form a tiled sur-

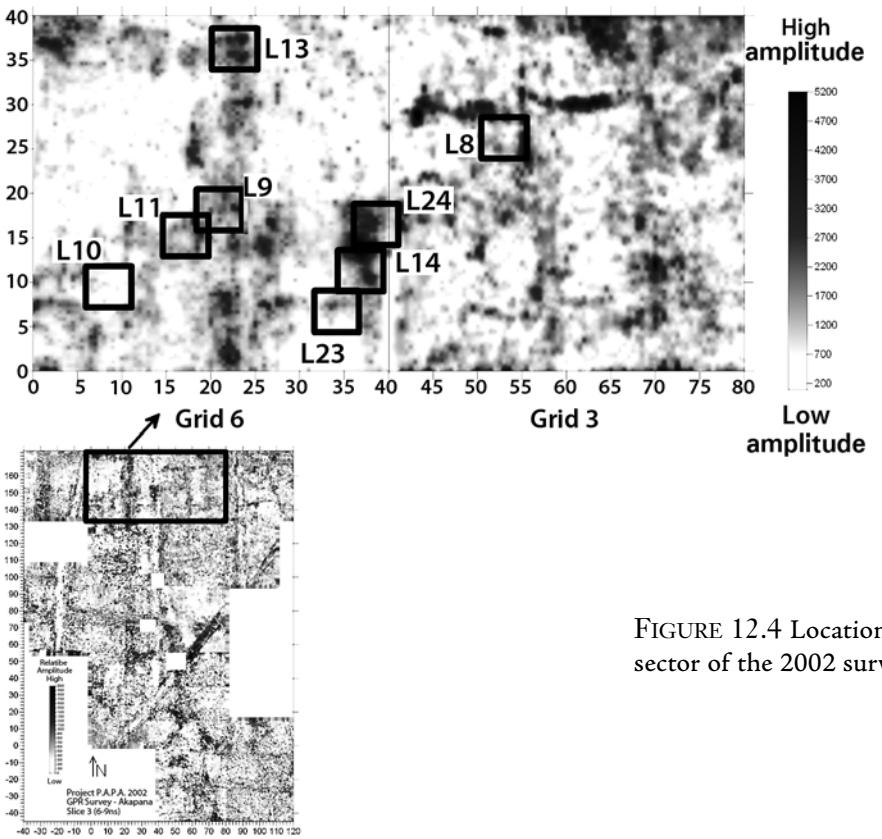

FIGURE 12.4 Location of excavations in the northern sector of the 2002 survey area.

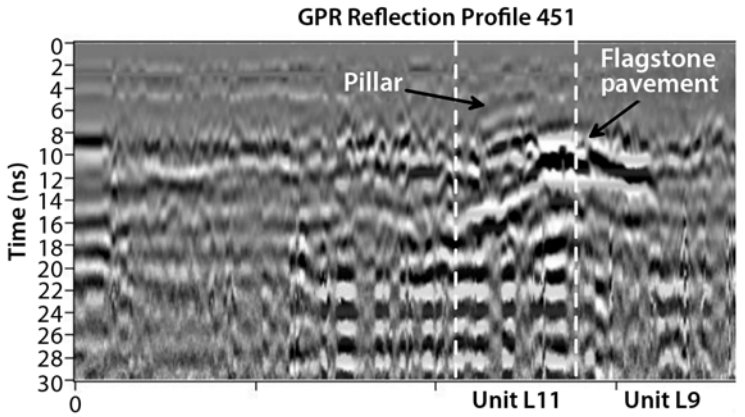

FIGURE 12.5 Units L9 and L11. GPR reflection profile 451, showing reflection produced from the flagstone pavement.

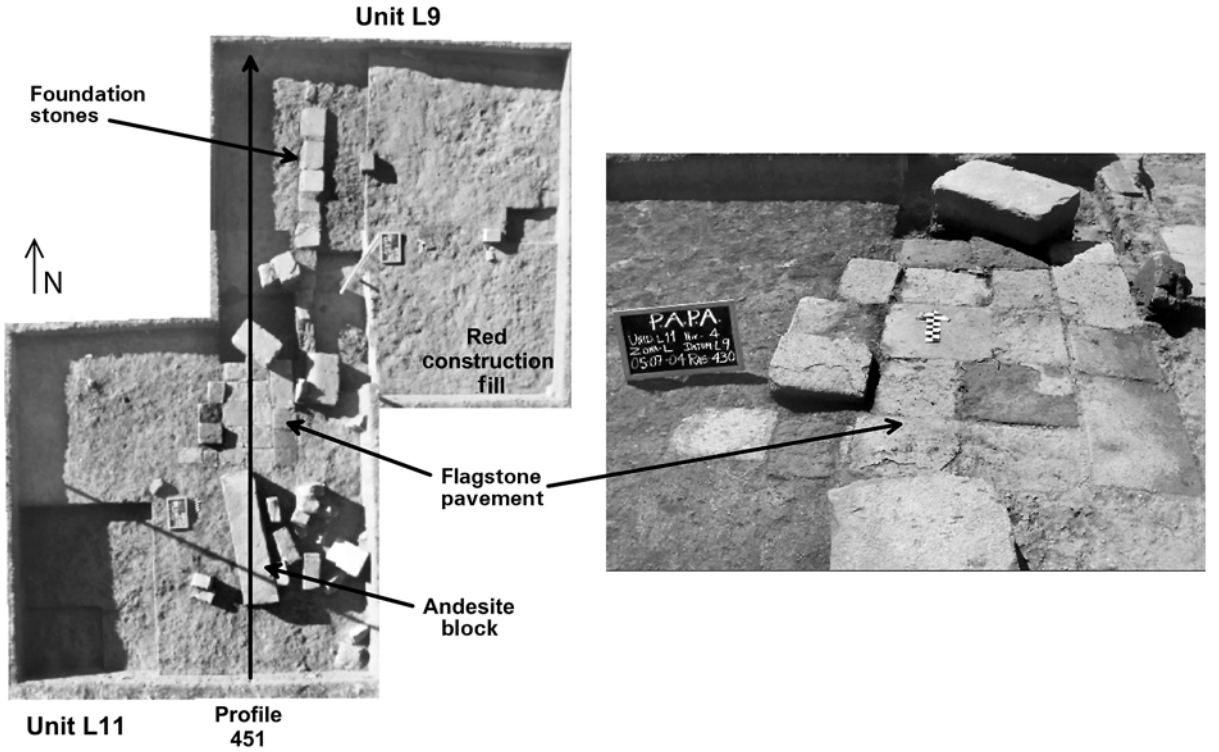

FIGURE 12.6 Units L9 and L11. Plan view of the eastern wall of the rectangular structure (P2), showing the flagstone pavement and foundation stones.

face. The flagstone pavement was missing sections, and several of the stones were uneven and disturbed. Farther to the south of the pavement was a scatter of cut andesite blocks and a large stone block.

The andesite block in L11 could have been an orthostat, or a large stone slab, set between coursed masonry, a typical Tiwanaku masonry method (Protzen and Nair 1997). It also bears similarity to a lintel noted by Couture (2002) in the structure she excavated to the east of the Putuni. The combination of paving stones and a possible lintel suggests that the area was near the entrance to this platform.

Unit L13 was located 15 m north of L9 in an area where the GPR amplitude slice maps showed reflections of what we thought could be the northeast corner of structure P2 (figs. 12.4, 12.7). Within the first 30 cm, rocks were unearthed in the northern profile of the unit, but none of them

were shaped or appeared in situ. These jumbled rocks were probably the remains of a conduit, because, although no stones were found in situ, the pattern of the surrounding rocks and the trench shape of very dark brown clay is typical of in situ conduits noted elsewhere. This conduit was within the upper levels of this unit and may have been associated with the platform structure. The conduit was also not very deep below the surface, suggesting that it may have been used to remove water from the top of the platform structure and eventually emptied into a larger conduit.

The excavation of L13 continued to the south of the conduit. While we did not find the continuation of the foundation from L9 and L11, we did find the same construction fill. Below this fill we found the remains of a flagstone pavement possibly related to an earlier construction (fig. 12.7). The pavement was not of the same quality as that in L9 and L11 and was covered in places with a thin layer of green ash. This same green-ash layer is associated with dedicatory burials from a Tiwanaku IV compound beneath the Putuni and in the Akapana East residential structures (Couture 2002; Janusek 2004b). Situated slightly above this pavement to the east was a flexed burial of a female with cranial deformation oriented to the north. Although the skull from this burial was obviously deliberately elongated, the bones were not analyzed to note the style (flat, round, or angular) (Blom 2005).

The intent of L10 (fig. 12.4) was to investigate a perpendicular intersection of two linear reflections apparent in Henderson's GPR amplitude slice map 5 between 12 and 15 ns (60–75 cm). This intersection occurred in a deeper slice than structure P2, so I hypothesized that this feature would be earlier (Tiwanaku IV). In the upper levels of the excavation and about 35–40 cm below the surface, we found a gravel surface with dense faunal and ceramic materials (fig. 12.8). The gravel floor surface was similar to that excavated in L6, but the density of artifacts was much greater. It is possible that the floor found in L10 was part of the interior courtyard of P2. The pattern of thick debris deposition, however, is very different from the fine red clay that capped the relatively debris-free Putuni interior (Couture and Sampeck 2003). This suggests that the function of P2 could have been different from the

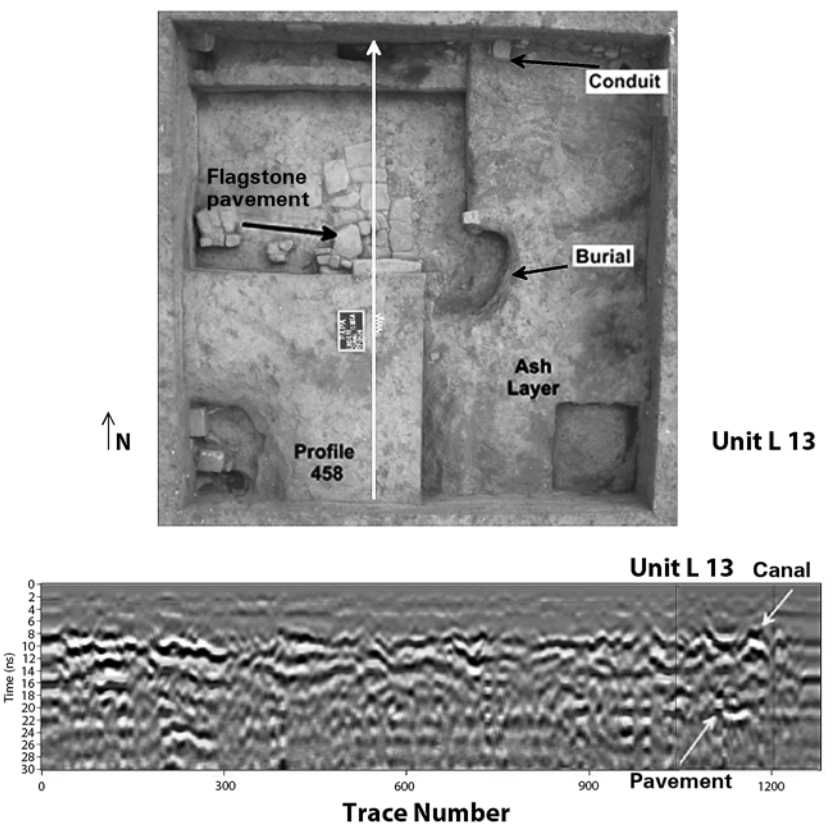

FIGURE 12.7 Unit L13 and GPR reflection profile 458. This unit contained a human burial (with a skull showing cranial deformation) and a pavement that was 80 cm below the surface.

function of the Putuni. Associated with the floor was a stone foundation found in the southeast portion of the unit (fig. 12.8). This foundation wall is apparent in GPR reflection profile 437 (fig. 12.8). When amplitude slice map 3 is examined, smaller walls are apparent within the center of P2, suggesting that it may at one time have contained rooms (fig. 12.9). This is also apparently a different pattern than the architectural layout of the Putuni, further suggesting that the functions of these two platform structures were distinct from each other.

Below the floor with dense cultural debris we encountered the source of reflection producing the perpendicular reflection in the GPR maps (see fig. 12.2, slice 5). This was a cobblestone feature and can be seen as a high-amplitude reflection in the GPR reflection profile 430 (fig. 12.8). Based on what is known about the architecture of Tiwanaku, this cobblestone surface could be part

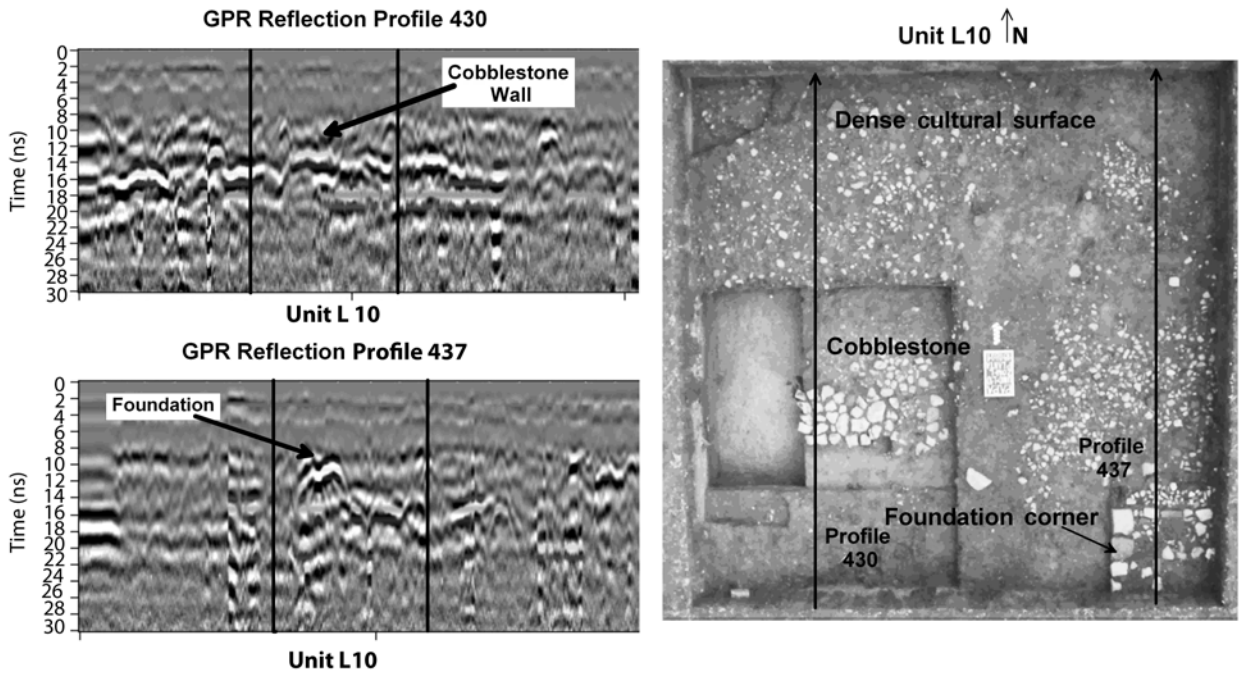

FIGURE 12.8 Unit L10, with a dense layer of cultural material, cobblestone wall or feature, and a corner to a foundation. GPR reflection profile 430 shows the cobblestone wall/feature, and GPR reflection profile 437 highlights the corner foundation.

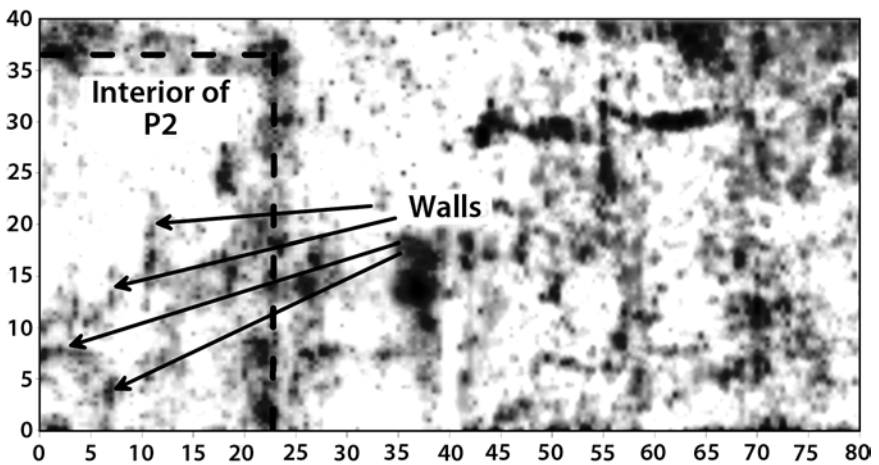

FIGURE 12.9 Northwestern portion of the GPR grid from the 2002 survey area. Walls inside structure P2 suggest that it may have rooms.

of a foundation of an earlier structure. In unit L2 Henderson also excavated a similar cobblestone feature 60–64 cm below the surface while investigating the approximately 50 m long north–south oriented reflection seen in fig. 12.2, slice 5. Cobblestone foundations similar to the feature in L10 and L2 were found below the Putuni and belonged to a Tiwanaku IV elite residential structure (Couture and Sampeck 2003). Residential compounds such as La K'araña, Akapana East 1 Mound, and Akapana East 1 also contained cobblestone foundations similar to the feature in L10 (Escalante Moscoso 2003; Janusek 2004b). I suggest, therefore, that these cobblestone features were part of compound walls from Tiwanaku IV residential structures that were razed during the architectural transition. It should be noted that Henderson (2004, 105–9) suggests that the north–south cobblestone feature could be an aqueduct similar to one found at Tiwanaku's "sister city" of Lukurmata, located in the adjacent Katari valley (Kolata and Ortloff 1996, 137). Either interpretation of the cobblestone feature would conform to the overall patterns identified at the site, indicating that more research is needed. Regardless of whether or not this feature was an aqueduct or compound wall, the once residential nature of the area west of the Akapana is further suggested by the archaeological findings to the east of structure P2.

Excavations were placed outside of the east wall of structure P2 to investigate additional high-amplitude reflections that were hypothesized to be other walls and floors not associated with P2 (fig. 12.4). Units L8 and L14 were excavated during the 2004 field season; units L23 and L24, during the 2005 field season. These four units demonstrate evidence for multiple layers of occupation, far more than the layers just below the Putuni itself, as described by Couture and Sampeck (2003). This evidence includes hearths, utilitarian ceramics, stone workshops, and multiple levels of renewed floors, and suggests that during Early Tiwanaku IV, the monumental core was a residential area similar to the other residential compounds excavated around the core. At some point during Late Tiwanaku IV the residential area was renovated multiples times, as is evidenced by numerous superimposed debris-laden floors. These floors could have been plaza areas for the increasing number of festivals and ceremonies held within the core. A similar pattern of floors continues through Tiwanaku V. It appears that during the span of occupation the area to the east of structure P2 was consistently in flux and may have been utilized by a variety of different people for different purposes, as is suggested by the diverse and dense artifact assemblage (Skidmore and Yates 2005).

The dense debris within the context of the gravel stratum from L5 and L6 and around P2 suggests that trash was either discarded in this area or that the cultural debris was intentionally incorporated into the matrix of the gravel floor. Blom and Janusek (2004, 126) note that dedicatory offerings are found in association with the construction fill of many of the razed and renewed high-status structures at Tiwanaku. These offerings include dismembered human and camelid remains as well as smashed ceramics and other materials, and are found in the fill levels of the Akapana and below the Putuni. The density of the debris, and the presence of human and camelid bones, may suggest that these surfaces also acted as dedications associated with renewal. Whether the gravel surface on the west side of the Akapana was itself an offering or just a floor with a great deal of debris, it demonstrates that this area was used for activities that were probably associated with great numbers of people participating in large-scale events.

Excavations in the Southern Sector West of the Akapana

Excavations in the southern sector of the GPR survey area focused on an area where the GPR reflections suggested a large, near-surface structure (fig. 12.10). This structure, which we are referring to as W1, was located roughly 10–30 cm below the surface. The full extent of W1 at this time has not been excavated, but based on the images produced from the radar data, we can suggest that the structure possibly extends to the south and east of the excavated area. The radar image slice maps also indicate another earlier structure below W1, which has been confirmed with test excavations. The earlier structure is also quite shallow, and no more than 45 cm below the surface. Due to the

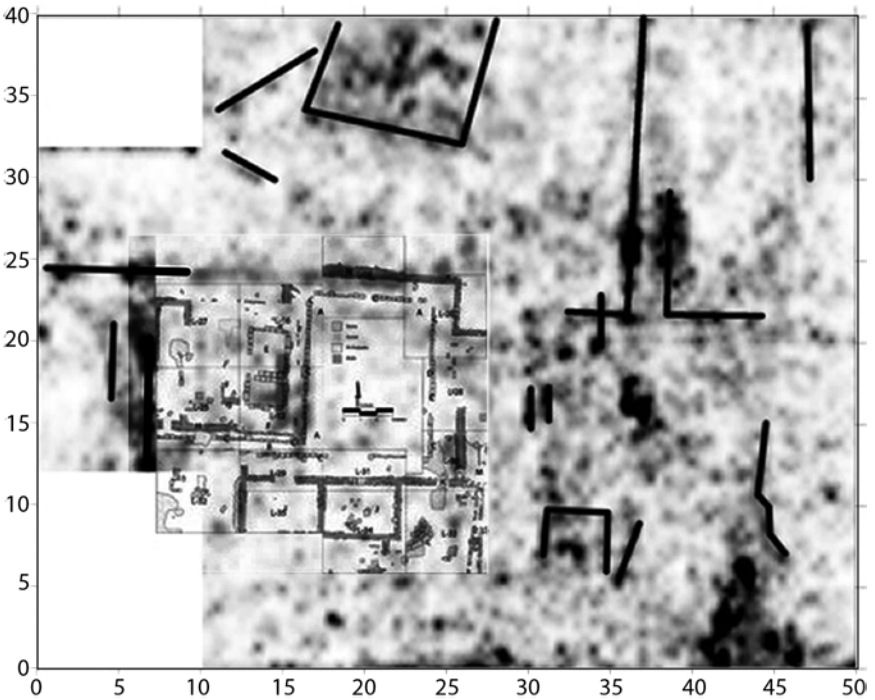

FIGURE 12.10 Southern sector of the 2002 GPR survey area with plan view line-drawn map of the excavation units and architecture encountered. The line drawing is slightly transparent so the GPR reflections can be seen. *Line drawing courtesy of W. Mattox.*

slightly uneven topographical surface and the shallow nature and varying depths below the surface of W1, at this time we cannot determine if all the unexcavated linear GPR anomalies belong to W1 or the earlier structure. Hopefully this can be resolved in the future with more directed excavations or by employing a higher-frequency antenna that can detect subtle changes with higher resolution of the near field.

From 2004 through 2006, W1 was excavated by C. Wesley Mattox. He found what we believe to be a small-scale ceremonial structure with an interior patio, rooms or chambers surrounding the patio, and a compound wall. The patio was lined with cut ashlars, which were likely removed from an earlier structure, since only the interior perimeter was flush. "Borrowed" ashlars were also used to construct the sunken courtyard of the Tiwanaku V Akapana East 1 north compound (Janusek 2003a). Although the interior of the patio of W1 was not fully excavated, the radar data reveal that it is relatively free of internal structures. However, a 2 by 2 m excavation of a single area of high-amplitude reflections in the center of the patio uncovered a large andesite block, but its purpose and relation to the structure at this time is unknown.

To the west of the patio is what we believe to be a water-retaining feature, possibly akin to a reflection pond, with laminated sediments. It was surrounded by a rectangular foundation of ashlars and divided into a northern and southern area by an internal ashlar pavement. The ashlars are also recycled stones from another structure. A very small and finely constructed drainage conduit with a stone stopper was located in the northeast interior wall of the feature. This suggests that the feature was periodically filled with water and drained, possibly in association with certain ceremonies performed in the structure. The significance of this and other water features on the site will be discussed below.

To the south of the patio, two 4 by 2 m rooms have been identified that may have been used for the staging of small-scale ceremonies that took place within the compound. To the north of the patio, we believe we have identified the northern compound wall. Excavations to the north of this wall revealed a great deal of trash and debris, suggesting that it was outside the perimeter of the formal structure (Wes Mattox, personal communication). Within the GPR image slice maps, the compound wall appears to extend to the east beyond the excavation and abuts with a north–south

running wall. The radar image also suggests the presence of numerous other walls and features to the south and east of the excavated area.

Preliminary ceramic analysis suggests that W1 dates to the final phases of Tiwanaku. However, its association with the deeper structure, and, therefore, the changes that occurred between the uses of these two structures, remains unknown.

2004 AND 2005 GPR ON THE EAST SIDE OF THE AKAPANA

In 2004 and 2005 I collected an additional 65,000 m^2 of GPR data on the east side of the Akapana (fig. 12.1). A modern fence surrounding the main monuments made this survey difficult, which is why there is a diagonal strip of data apparently missing from the GPR maps, seen here in black (fig. 12.11).

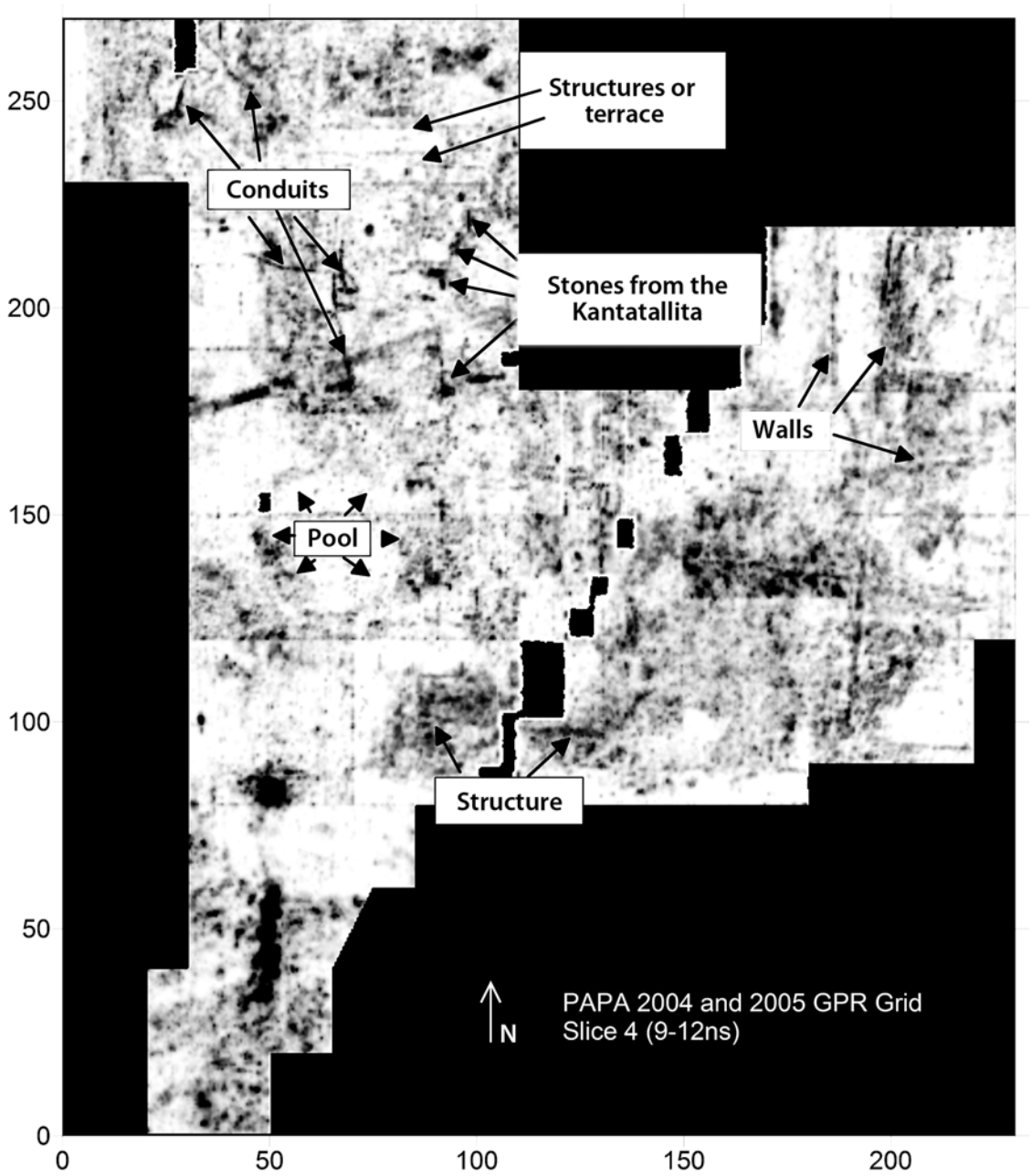

FIGURE 12.11 Annotated GPR survey area from 2004 and 2005 showing various structures, features, and conduits.

The amplitude slice maps produced from processing the GPR data show a circular feature to the south of the survey area, large blocks likely associated with the Kantatallita, numerous conduits, and four other possible structures (fig. 12.11). Several of these features were investigated through excavation during the 2005 field season and will be discussed here.

EXCAVATIONS ON THE EAST SIDE OF THE AKAPANA

In 2005, excavation units were placed in various locations on the east side of the Akapana to investigate the source of significant radar reflections from the 2004 data set (fig. 12.12).[1] In excavation units S1 and S2 we encountered in situ architecture in the form of north–south linear walls of foundation stones (fig. 12.13). This shallow ashlar foundation was potentially associated with the Kantatallita, and the stones were likely reused from an earlier structure, much like the ashlars in W1 and the Akapana East 1 north compound. A clean gravel floor was encountered roughly 30 cm below the surface and just below the base of the foundation stones, suggesting that the foundation was a later addition. Situated within the gravel floor in the northwest corner of unit S1 was an elevated capstone of a conduit. This capstone was concave and had a hole in the center that was

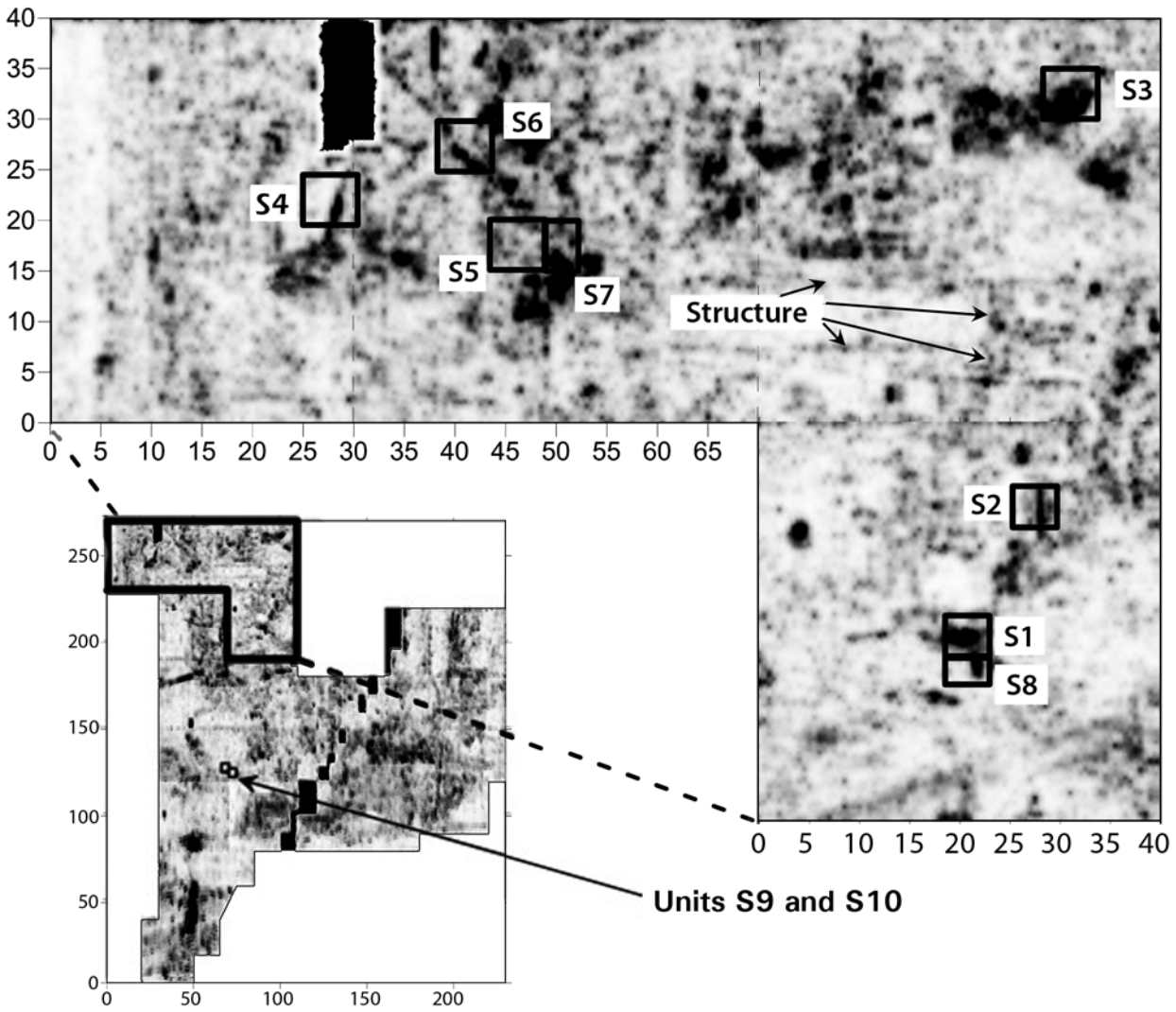

FIGURE 12.12 Northern portion of the 2004 and 2005 GPR survey area, with the locations of the 2005 excavation units highlighted.

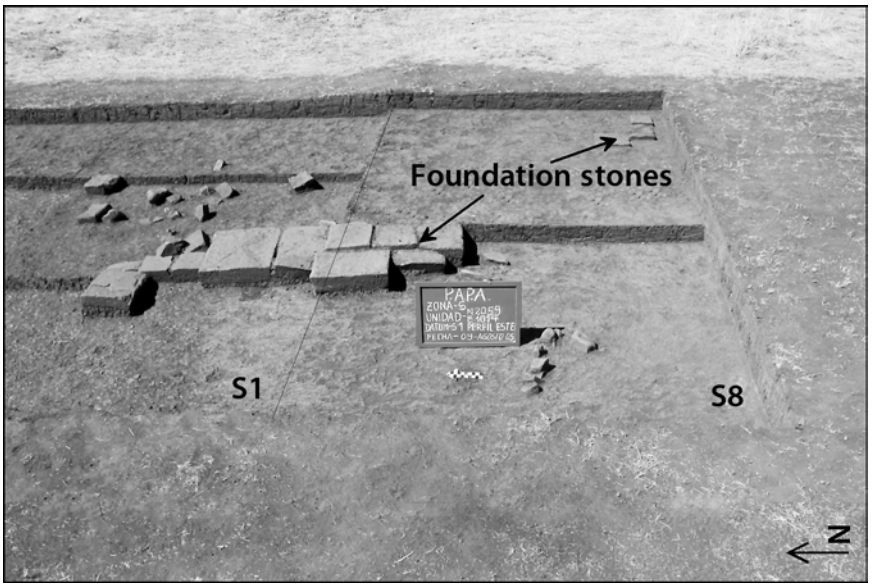

FIGURE 12.13 Units S1 to the north and S8 to the south show the foundation stones that created the high-amplitude reflection shown in black in figure 12.12.

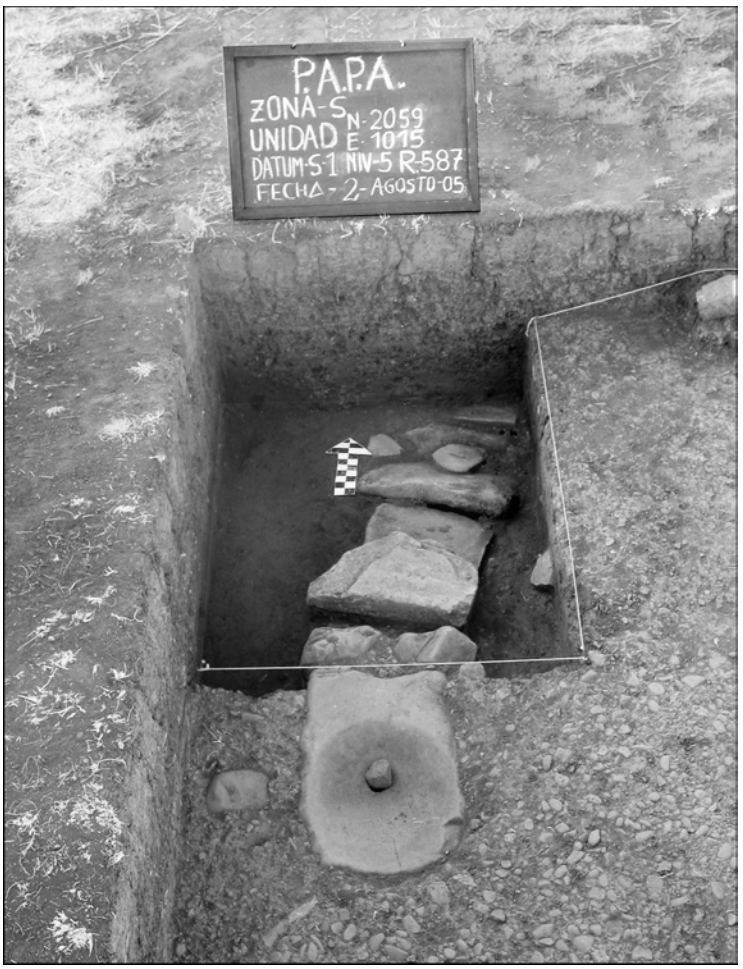

FIGURE 12.14 Conduit in the northwest corner of unit S1. The concave stone with a hole is at the same level as the clean gravel floor. The round stone in the center of the concave stone is a plug for a hole that would have drained into the conduit below.

plugged with a perfectly fitted carved stone (fig. 12.14). This feature was obviously a drain, as further excavation revealed the conduit to continue directly below the level of the gravel floor. The gravel floor sloped toward the center of the elevated capstone so that water would have been funneled through the hole and into the conduit system below.

What I hypothesize to be the same floor was encountered in units S3 through S7. In S5 and S7 this floor was roughly 60 cm below the surface; in S3 and S4, about 45–50 cm below the surface; in S6, about 50 cm below the surface. Excavation by the Dirección Nacional de Arqueología de Bolivia (DINAR) on the immediate east side of the Akapana in 2004–5 also revealed what may be the same floor. The evidence that this one continuous floor extends over such a large portion of the east side of the Akapana suggests that this was one large open area. The surface of the gravel floor was relatively clean, but ceramics from just below the level of this floor were mainly monochrome and utilitarian in nature. Due to the cleanliness of the floor, it could not be dated, but the dearth of structures and features above the floor suggests that it was in use in the final phases of Tiwanaku occupation. This pattern of clean floors is also apparent in Akapana East and the K'atupata platform at Lukurmata and suggests a potentially important pattern, which is especially apparent in contrast to the densely debris-laden floors on the west side of the Akapana (Janusek 2004b).

Servicing the gravel floor surface in S6 and S4 were conduits, which can be easily seen in the GPR amplitude slice maps (fig. 12.11) and the photograph of the excavation (fig. 12.15). Associated with the conduit in S4 was a burial of a bound female, face down and oriented east. The unique orientation along the route of the winter solstice axis and face-down position with hands possibly bound behind the back indicate that this person may have been a sacrificial offering. The burial was within the gravel floor and within the same level as the capstones of the conduit, suggesting that the conduit and human offering were associated.

Directly below the gravel floor in S5 and S7 were the remains of walls and associated domestic undecorated ceramics (fig. 12.16). This follows the pattern established throughout the site, where earlier structures were razed to accommodate new construction. In the case of S5 and S7, the earlier structure was razed and replaced with a gravel plaza.

The GPR amplitude slice maps show another structure immediately to the east of unit S7. This structure is on the same level or a level above the gravel floor (roughly 45–50 cm below the surface) and has a double exterior wall and fairly large rooms (figs. 12.11, 12.12). However, it is also possible that these reflections are associated with a series of terraces descending to the north (see Ernenwein and Koons 2007). The stratigraphy of S3 may confirm the presence of the terraces. Within S3 we noted the gravel floor, and below this floor was a large amount of debris mixed with clay and silt and containing large lenses of ash. Quite possibly. this was fill placed to level out and terrace this northwardly sloping portion of the site. However, this debris is similar to the debris found outside of the residential compounds farther east (Janusek 2003a), which

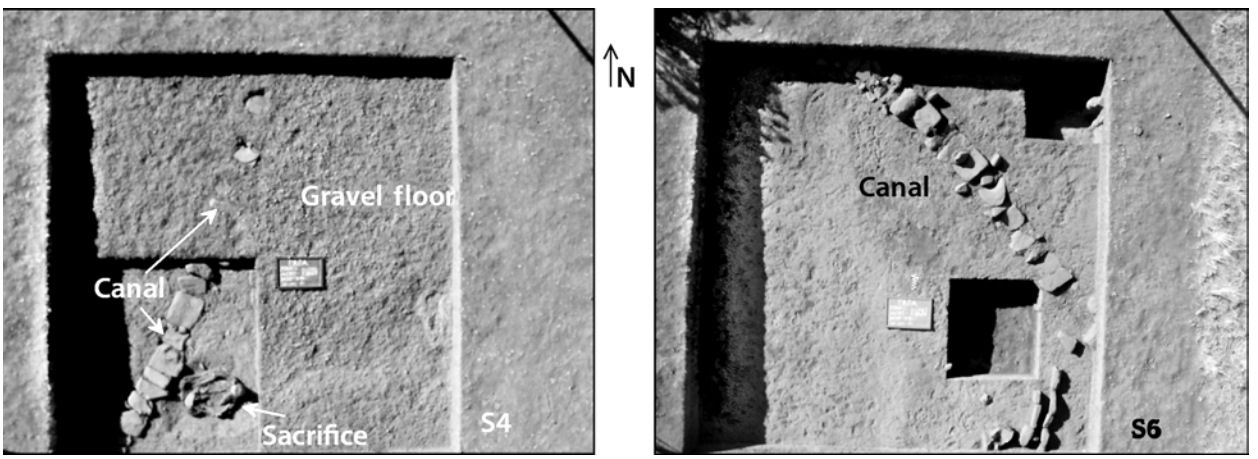

FIGURE 12.15 Plan view of units S4 and S6, showing the conduits present in both. Just above and encompassing the layer of the conduits is a clean gravel floor. A sacrificial victim is in association with the conduit in S4.

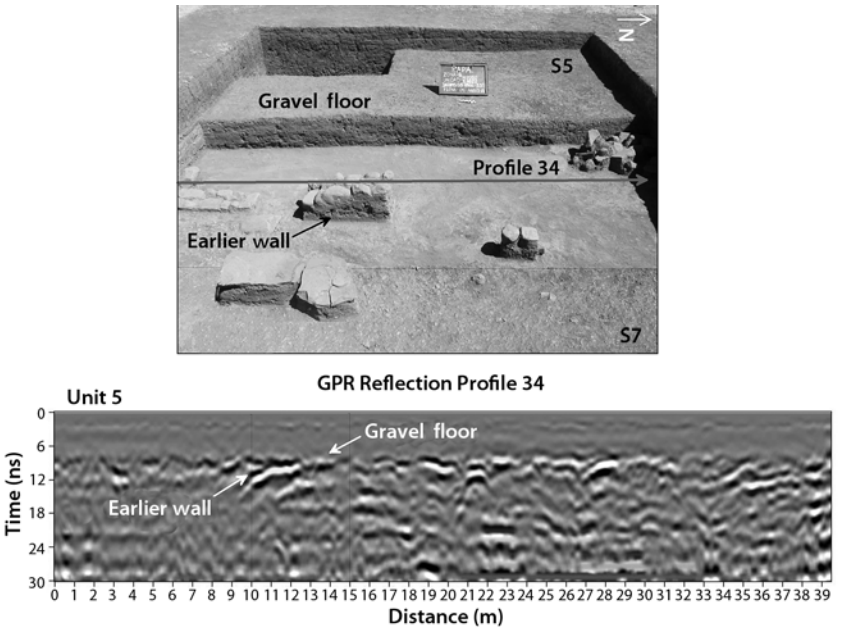

Figure 12.16 Units S5 and S7, facing west. The origin of the GPR reflection in profile 34 was the Tiwanaku IV or earlier wall. The subtler reflection above the earlier wall was from the gravel floor.

could indicate that the reflections correspond to compound walls. At this time, the source of the reflections needs more investigation.

TIWANAKU WATER MANAGEMENT

Based on patterns within the GPR maps, together with the excavations of S1, S4, and S6 and other known excavations at the site, it can be determined that the numerous, linear, noncardinally oriented reflections correspond to conduits. On the east side, there are many shallow conduits, mostly between 45 and 60 cm below the surface. Based on the excavations, we know that they are located directly below, or within the same level as, a patio or plaza surface. By tracing the patterns and depths of the highly visible GPR reflections created by the unexcavated conduits, we can deduce the location of plaza areas. These patterns indicate that a huge open area characterized the east side of the Akapana during the later phases of site occupation.

Conduits are also present on the west side of the Akapana. However, these occur at varying depths, suggesting that they were either constructed at different times or served to drain distinct surfaces not associated with a contiguous plaza like that present on the east. The gravel floors at variable depths on the west side do suggest that that there were multiple levels of open space that may have been renovated at different times leading up to the transition. As noted, what I suggest to be a Tiwanaku IV compound wall located in the center of the west side GPR grid was razed and never superimposed with other architecture, just gravel surfaces. Therefore, it appears that the west side of the Akapana, like the east side, was also open space during the final Tiwanaku V occupation, although it may have been configured differently.

Aside from the numerous subterranean conduits, a series of circular features were identified to the immediate east of the Akapana. Figure 12.11 shows the largest of these circular features in the center of the eastern GPR grid (labeled "pool"). This particular feature has a diameter of roughly 40 m. Evidence suggests that these circular features were stone-lined and once filled with standing water. The lack of GPR reflections inside the circle suggests that there was more clay here than in other parts of the survey area. High clay content causes GPR signal attenuation and a lack of depth penetration. Two excavation units (S9 and S10; see fig. 12.12) were placed inside this feature and confirmed that sediments were exceptionally hard and clay-rich, with little internal stratigraphy. Sediment consolidation like this occurs from standing water. It is also significant that two andesite-lined circular pools were noted in photographs from the 1890s by the German ar-

chaeologist Max Uhle. One of these was to the south of the main core and near the Pumapunku. The location of the other pool has not been reidentified. It is possible that one of the pools identified through our geophysical method could have been the pool photographed by Uhle.

These pools are strikingly similar to *qochas*, or rain-fed pools, seen throughout the Andean highlands. Qochas are agricultural features that date to as early as the Initial period and continue to be used today (Erickson 2000). They are mainly circular, but oval and small rectangular ones do exist. Most range from 0.1 to 4 ha in diameter (Erickson 2000, 338). They have many functional uses, including water storage during the dry season, growing crops, and as a source of drinking water (Erickson 2000, 340–41). Throughout the Titicaca Basin, series of qochas are connected to each other by complex canal systems.

It is possible that the pools found to the east of the Akapana were similar to qochas yet with a more ritualistic or ceremonial function. These pools are in direct association with the elaborate conduit system, and their proximity to the monumental core suggests that water ceremonies played an important role at the site. The water feature found in structure W1 also suggests that water was integral to Tiwanaku ceremonial life. Furthermore, Kolata (1993, 104; 2003b, 184–87) notes that the Akapana contained an elaborate drainage system, which he claims symbolically associated it with a sacred mountain, such as Quimsachata to the south or Illimani to the east. Kolata (1993) also notes that a moat surrounded the major monuments, which can be directly related to the intense relationship the people of Tiwanaku had with water. These combined data sets demonstrate that water management and manipulation were very important features of the site and deserve further investigation.

SUMMARY OF RESULTS

Based on the archaeological and geophysical research conducted between 2002 and 2005, we now have a much clearer picture of the dynamic nature of the monumental core. The architectural transition that occurred sometime around the ninth century was likely a slow and varied process and cannot be viewed as a singular event. This is suggested by the numerous gravel floors encountered on the west side of the Akapana that tentatively date to Late Tiwanaku IV. The last phase of the site (Tiwanaku V) on both sides of the Akapana is marked by fine ashlar foundations in many of the constructions, including structures W1 and P2 on the west side and the Akapana East 1 north compound on the east side, and large open spaces (Janusek 2003a, 2004b). The fact that many of these buildings used "borrowed" ashlars does remain puzzling, however. Nonetheless, it fits with Vranich's (1999) model that considers Tiwanaku to be like a religious amusement park, with the elaborate architecture visible to the public and the "rougher" architecture hidden behind the scenes.

It is also apparent from this study that although there are similarities in the character of the east and west sides of the Akapana, marked differences do exist. This is most notable in the presence of a clean, artifact-free floor that extends across much of the flat area on the east side of the Akapana and was in use during the final phase of the site. This clean floor covered earlier domestic structures that were razed, suggesting that the people who were once living in close proximity to the Semisubterranean Temple were displaced from the center of the site to make room for more public ritual space. Where these people were relocated is uncertain, but the numerous residential compounds immediately outside the main core were densely occupied during Late Tiwanaku IV and Early Tiwanaku V (Janusek 2003a). Therefore, it is possible that they did not move very far. The clean floor on the east side is contrasted with the dense and multiple levels of artifact-laden floors on the west side of the Akapana. This dichotomy may be of some significance. The artifact-rich surfaces west of the Akapana may be dedications associated with episodes of construction renewal, as discussed. In contrast, clean surfaces like those found in the open space east of the Akapana are noted inside residential compounds and the Putuni. Whatever the meaning behind these noted patterns, they indicate that very different activities were performed on the different sides of the Akapana during the later use of the site.

Numerous conduits are present on both sides of the Akapana. On the east side, tracking these conduits allows us to trace the level of the continuous gravel surface and determine its depth of roughly 45–60 cm below the surface. A large pool, and possibly a series of other pools—interpreted from the integration of multiple geophysical methods (Ernenwein and Koons 2007) and excavation —exist on the east side of the Akapana, demonstrating that our understanding of the importance and significance of water management and manipulation at Tiwanaku is still in its infancy.

Overall, the changes that occurred around AD 800 incorporated finer architecture and more open ritual space. Not coincidentally, it was around this same time that Tiwanaku influence reached its apex across the region and can be seen in the remains from the Moquegua valley, Peru, and Cochabamba, Bolivia. Therefore, the introduction of public space, along with finely faced architecture, created a public arena for the increasing number of people traveling into Tiwanaku with the expanding sphere of influence.

DISCUSSION

The ideas I present here about the inclusive organization of the monumental core of Tiwanaku around the time of the architectural transition at AD 800 are in line with what is known about Andean social organization in general. The ayllu kinship system, which was largely based on dualism and the "balancing" of binary oppositions, was a major factor in the way Andean people organized their settlements and other aspects of their lives for thousands of years (Gelles 1995; Goldstein 2005, 30; Zuidema 1983, 1990). Today as well as in the past, this balancing was achieved through different means, including ritual battles known as Tinku. In Inca times, the state sponsored and oversaw these competitions, where the different ayllus took turns leading the "battle." The alternating of the "winners" and "losers" of these battles was viewed as a necessity to achieve equilibrium within the society (Gelles 1995). Overall, the competitiveness between ayllus functioned to catalyze and energize labor relationships and communal projects so that everyone benefited from their outcomes.

Although today the word *Tinku* in many ways is synonymous with ritual battle, the actual meaning in Quechua is "coming together" to achieve balance, and where this occurs is considered sacred. In this respect, the term refers to any two parts that come together to make a whole. This can be two branches of an irrigation canal meeting up to form one large branch, the confluence of two rivers, or the seam holding two pieces of cloth together (Harrison 1989; Ossio Acuña 1992). The coming together of different factions or moieties of an ayllu or multiple ayllus is also a form of Tinku. These unions occur at a central place known as a *marka* (see Janusek 2004b, 41– 45).

Highland Bolivia in the past, as well as today, consisted of small hamlets or villages dispersed across a region. Kin groups from these dispersed settlements converged at a marka at important times of the year to participate in ceremonies and ritual acts to achieve societal balance. The creation of more public space at Tiwanaku at the height of its regional influence suggests that it was a marka. Competition among ayllu factions at this center would have been fundamental to the functioning of the society as a whole.

As I have discussed, the different residential compounds around Tiwanaku have been associated with distinct ayllu groups. This interpretation is based on the different patterns of material culture found in the different compounds (see Couture 2003; Couture and Sampeck 2003; Escalante Moscoso 2003; Janusek 2003a; Rivera Casanovas 2003). As the importance of Tiwanaku increased, more and more people were traveling to the center, and the competition between ayllus also increased. The more elegant and elaborate architecture has been interpreted as a reflection of this increased competition and exclusivity (Couture 2002). However, rather than this competition leading to a more exclusive and elite-centric settlement after AD 800, the evidence I present here suggests that it fostered a more inclusive environment to accommodate pilgrims from all around the south central Andes. In all the previously investigated areas of the site, the earlier compounds were razed and renewed with the more elaborate later compounds. Until the research presented here, there was no evidence that some of the com-

pounds were razed and never rebuilt. Furthermore, previous research did not indicate that people once residing immediately next to the Akapana were forced to move away from there to accommodate more plazas and open space during the latter years of site occupation, as I have shown here. With the more open space, the elaborate Tiwanaku V architecture would have been visible to many people who could now congregate in the monumental core. The elegant architecture can still be interpreted as evidence for increased competition among the elite. However, it also could have been used to instill a sense of awe in the pilgrims and, therefore, was a symbol of the overall power and influence Tiwanaku had in the region.

Overall, I contend that the evidence presented here demonstrates that Tiwanaku was where people from various regions came together. Moreover, it has been suggested that the word *Tiwanaku* is a derivative of *Taypicala*, which in Aymara means "stone in the center" (Escalante Moscoso 1997, 101). The competitive yet inclusive nature of the practices performed in the core is reflected in the architectural changes that occurred over time. This interpretation is in line with what we know about Andean organizational principles and shows that these practices are rooted in antiquity.

CONCLUSION

The methodology used here is a unique and efficient way to understand the potential significance of large spaces containing buried architectural elements of the past, elements that were utilized for multiple purposes over long periods of time. The GPR method of three-dimensional mapping integrated with selective excavations on such a large scale is a distinct way of conducting archaeological research. Placing strategically located excavations based on significant radar reflections allows us to extrapolate information from limited excavations across a much larger area. Traditionally, single compounds or complexes are completely or partially excavated, then placed into the context of the entire site. Individual or isolated excavations were not seen as a valuable research tool because of the incredibly complex stratigraphy and multiple layers of occupation present at the site (Couture 2002). However, my work shows that contexts of individual excavations can be projected onto a greater area when GPR reflection profiles and maps are consulted. Therefore, individual excavations can then be used to tell a great deal about the nature of subsurface cultural remains that would otherwise be invisible. By employing the GPR method and selective excavation, I was able to illuminate the changes that occurred throughout Tiwanaku's monumental core around AD 800. This information can be integrated with data from each individual building to tell a more complex and holistic account of the changing nature of Tiwanaku's sociopolitical dynamics.

NOTE

1. Unlike the units on the west side of the Akapana, the units on the east side were named in accordance with a grid established by the Bolivian government. Because the numbering system is cumbersome and confusing, I renamed the units for the purposes of this project:

Original Unit Number	New Unit Number
Unit N 2059, E 1015	S1
Unit N 2062, E 1018	S2
Unit N 2061, E 1026	S3
Unit N 2046, E 1023	S4
Unit N 2050, E 1022	S5
Unit N 2049, E 1024	S6
Unit N 2051, E 1022	S7
Unit N 2059, E 1014	S8
Unit N 2054, E 998	S9
Unit N 2054, E 999	S10

Chapter 13

Excavation and Analysis of Human Skeletal Remains from a New Dedicatory Offering at Tiwanaku

John W. Verano

In 2005, excavations southeast of the Kalasasaya, directed by the archaeologist Arturo Rivera of Proyecto Arqueológico Pumapunku-Akapana (PAPA), discovered an offering of human and camelid remains accompanied by elaborate polychrome ceramics and other artifacts. Excavation of the offering and analysis of the skeletal remains were completed during the 2006 field season. This study first reviews previous discoveries of human offerings at Tiwanaku and their interpretation in order to contextualize this more recent find. The new offering will then be described, with a focus on the human skeletal remains, their context and demographic profile, and evidence of skeletal pathology. These data will then be compared with the known corpus of human offerings at Tiwanaku, highlighting similarities as well as some unique features of this particular offering. It will be argued that this new discovery represents a form of human offering not previously known from Tiwanaku.

Human Offerings at Tiwanaku

Human dedicatory offerings have been reported from various contexts at the site of Tiwanaku (Blom and Janusek 2004; Blom, Janusek, and Buikstra 2003; Couture 2003; Couture and Sampeck 2003; Manzanilla and Woodward 1990). In their 2004 article, Blom and Janusek propose that these offerings take two distinct forms. The first is typified by human and camelid offerings found at the Akapana. Here, fully and partially disarticulated skeletal remains have been found associated with the base and upper surface of the lowest terrace of the platform, in some cases associated with large concentrations of broken polychrome ceramics (Manzanilla and Woodward 1990). Original study of the human skeletal remains did not identify cut marks or other indications of intentional dismemberment, but a reexamination of the material by Deborah Blom found numerous cut marks and impact fractures, indicating that the human remains had been dismembered intentionally (Blom, Janusek, and Buikstra 2003). Blom also identified carnivore damage on some bones from the base of the terrace, as well as surface bleaching and cracking on an offering from the top of the terrace, suggesting that these remains had been left exposed to the elements for some period of time before being buried.

The second type of human offering Blom and Janusek identify at Tiwanaku is associated with ceremonial architecture in residential compounds east of the Akapana. In this case, human remains appear to have been collected, in some cases defleshed, and then carefully buried, often in bundles, in mounds sealing clean ritual spaces. The burial of these structures appears to mark a final sealing and abandonment of these ritual spaces; the human offerings are believed to represent ancestral remains incorporated into the ritual interment (Blom and Janusek 2004).

Blom and Janusek hypothesize that the Akapana and Akapana East offerings mark rituals associated with the dedication or abandonment of

architectural complexes at Tiwanaku. They emphasize, however, that the two activities were quite different in terms of their visibility (public monumental architecture vs. private ritual space) and the identity (possible sacrificial victims vs. ancestors) and treatment (careful burial vs. exposure) of the human remains found in these offerings. The new offering described in this chapter shares some features with both types, but in other respects it is distinctive.

A NEW OFFERING

Location and Context

The offering is located approximately 100 m east of the southeast corner of the Kalasasaya and about 50 m north of the northeast corner of the Akapana (fig. 13.1). The field designation for the excavation unit in which it is located is Zona Sur, Unidad N 2043, E 1023. The skeletal remains were found in a roughly oval-shaped pit with dimensions of approximately 170 by 200 cm, with the long axis of the oval oriented north–south. The deposit of skeletal remains is shallow, with a maximum depth of about 120 cm and minimum depth of about 90 cm below the present ground surface. In addition to the skeletal remains, an offering of thirteen polychrome ceramic bowls (*escudillas*), placed in three sets, and two metal objects associated with small burned areas were found on the east side of the bone concentration. Directly associated with one of the skeletons were *kero* fragments with polychrome decoration. The ceramics are of Tiwanaku IV–V style, indicating that the offering dates to c. AD 700 (A. Vranich, personal communication, October 16, 2006).

FIGURE 13.1 Location of the offering, looking west, with the east gateway of the Kalasasaya in the background.

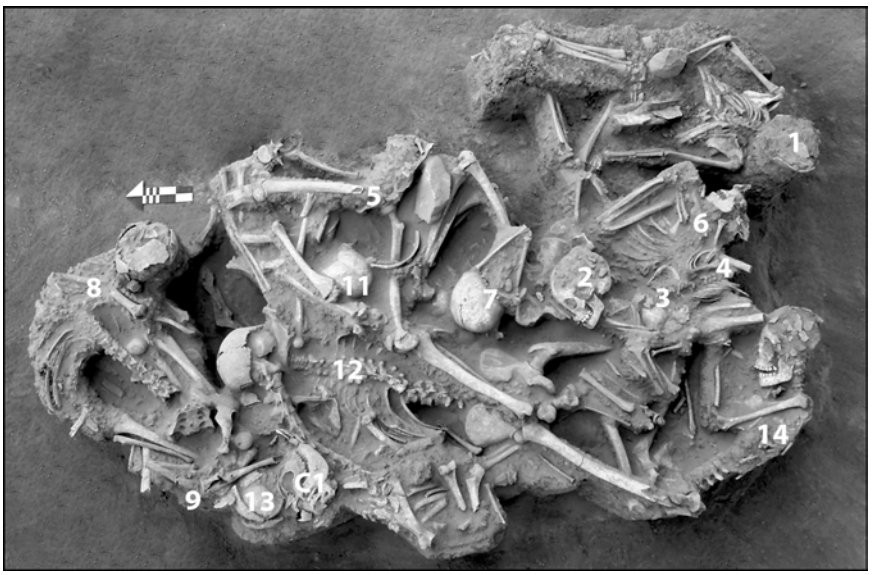

FIGURE 13.2 Uppermost layer of the offering, with numbers marking the various individuals. With the exception of I10, I15, and I16, all are visible at this level, although elements of some individuals overlie others. The skull marked C1 is one of two camelid skeletons.

Excavation Procedure

The bone concentration was pedestaled and covered with protective materials at the end of the 2005 field season. In July 2006 it was exposed for final cleaning and excavation. As an initial step, a sunshade was erected to protect the bones from ultraviolet light and excessive fluctuation in temperature. The excavation strategy involved first recording and removing those skeletons that were most superficial or were located at the margins of the pedestal and could be excavated without disturbing other remains. We then worked downward to the base of the deposit. All cleaning and removal of bones was done with bamboo picks and paintbrushes to avoid damaging bone surfaces. In the field laboratory, bones were further cleaned, photographed, analyzed, and boxed for storage.

Results

Excavation revealed that a minimum of sixteen individuals (and two camelids) were buried in the offering pit. Remains were assigned field numbers in the order in which they were exposed and removed. Figures 13.2–13.5 show sequential photographs of the deposit as it was excavated, with individual sets of remains numbered. Descriptions of each are given below.

INDIVIDUAL DESCRIPTIONS OF HUMAN REMAINS

Individual 1

I1 lay face down, with the legs tightly flexed at the knees. The left arm was slightly flexed at the elbow; the right arm was extended. Associated with the skeleton was a rock over the left elbow and a camelid scapula over the lower back and pelvis. Dental development gives an age estimate of approximately ten years. The frontal bone shows flattening, indicating cultural modification of the skull. The canine teeth show multiple enamel hypoplasias (fig. 13.6), which mark episodes of nutritional stress or illness during childhood (Goodman and Rose 1990), but no other dental or skeletal pathology was noted. Long bones were too fragmentary to measure.

Individual 2

I2 lay flexed on the right side, with the left arm flexed at the elbow and left hand lying under the

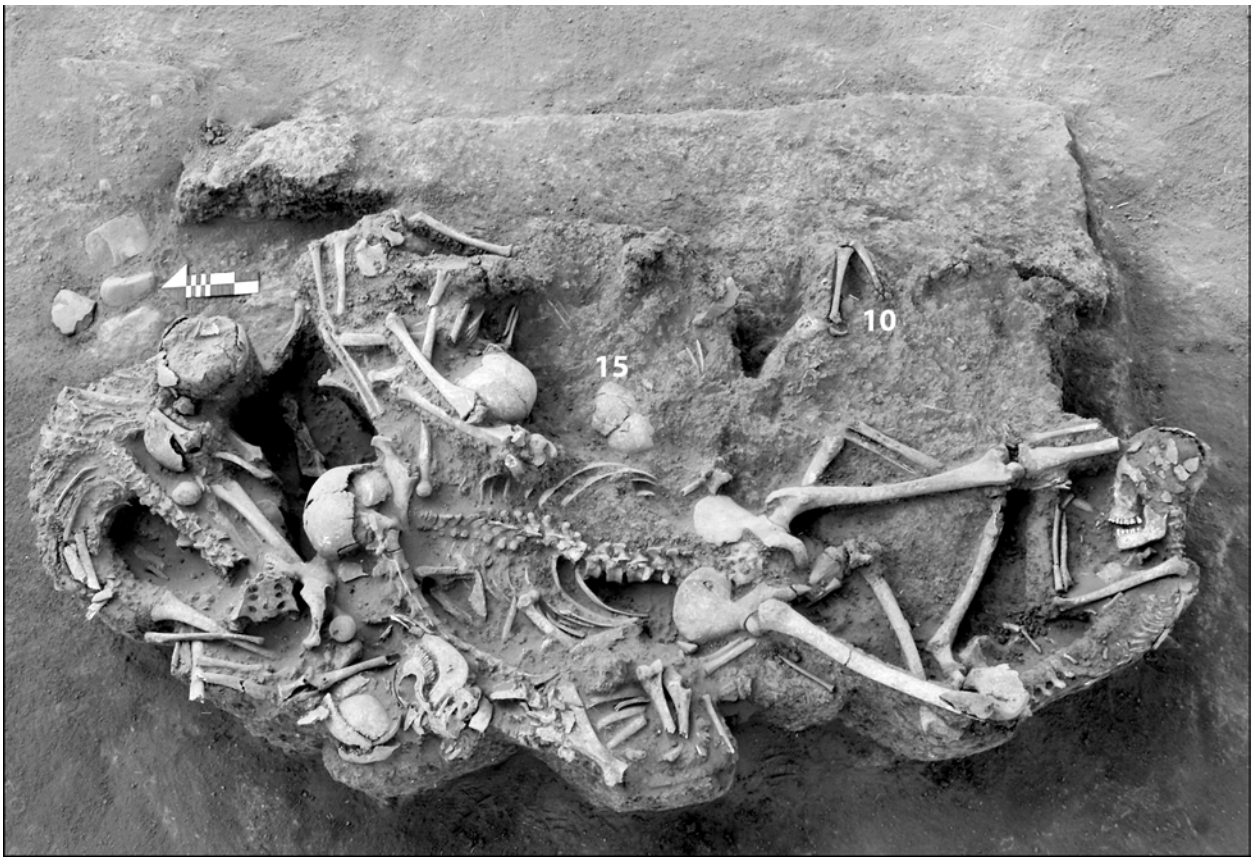

FIGURE 13.3 After removal of skeletons overlying them, I10 and I15 are now visible.

FIGURE 13.4 The last four human skeletons to be removed (I12–I15). In this photo, several neck vertebrae of the second camelid skeleton (C2) are visible.

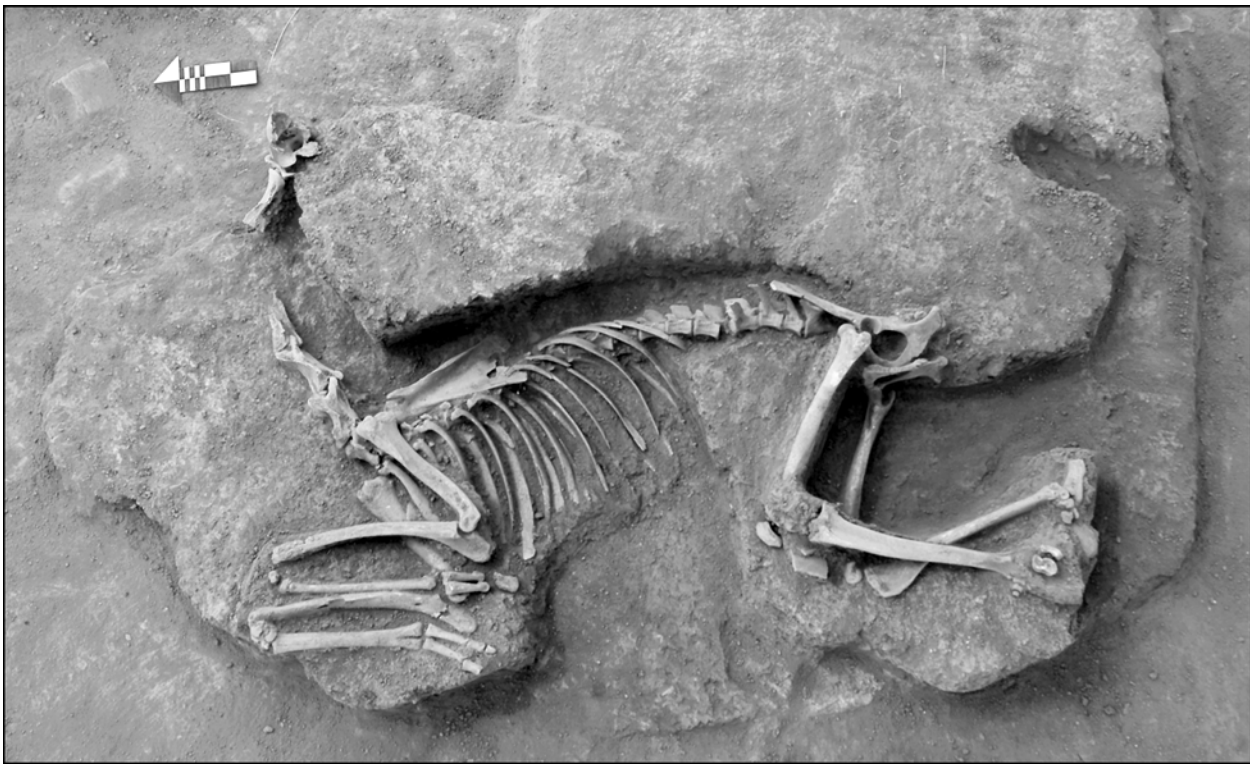

FIGURE 13.5 The second camelid skeleton (C2) lay at the base of the offering pit, separated from the remaining skeletons by 10–15 cm of soil.

FIGURE 13.6 Enamel hypoplasias on the lower right permanent canine of I1.

FIGURE 13.7 Multiple fine hypoplastic lines on the upper incisors of I2.

FIGURE 13.8 Supernumerary tooth (a mesiodens) erupting through the midline of the palate of I2.

chin. Dental development provides an age estimate of approximately seven years. The frontal bone shows flattening (cultural modification). Dental pathologies include multiple hypoplastic lines on the enamel of the upper incisors (fig. 13.7) and a supernumerary tooth emerging from the midline of the palate (fig. 13.8). No skeletal pathology was observed.

Individual 3

I3 lay prone with its head on its right side. The skeleton is incomplete, missing the pelvis, lower limbs, and left arm. Dental development indicates an age of approximately three years. The upper incisors show wear and chipping, indicating either mastication of particularly hard food or the use of the teeth as tools (fig. 13.9), although the latter seems unlikely in a child this young. No skeletal pathology was observed.

FIGURE 13.9 Chipping of the occlusal surfaces of the upper incisors of I3.

Individual 4

I4 consists of only a mandible and skull fragments of an infant, found in the pelvic area of I2. Based on dental calcification, age is estimated at about six months. No skeletal or dental pathology was observed.

Individual 5

I5 was assigned to an articulated pelvis, sacrum, legs, and some foot bones of a late adolescent/young adult male (eighteen–twenty years old). Living stature was estimated, using the Genovés formula (Genovés 1967), at approximately 159 cm, based on the maximum length of the left femur (405 mm). No skeletal pathology was observed, but the femora show particularly robust gluteal tuberosities—the insertion area on the proximal femora for gluteus maximus, the major extensor muscle of the thigh (fig. 13.10). Similar robusticity was found in an adolescent male skeleton from Machu Picchu and was interpreted as a possible indicator of habitual climbing of steep terrain (Verano 2003a).

Individual 6

I6 is the nearly complete skeleton (missing the right arm and top of the skull) of an adolescent female. The skeleton lay on its right side, with the legs and left arm flexed. Camelid leg and foot bones lay over the right femur, and a camelid calcaneus lay on the left innominate bone. A patch (32 by 16 mm) of unremodeled subperiosteal bone is present on the medial aspect of the distal end of the right tibia, just above the ankle (fig. 13.11). It may represent trauma (an ossified hematoma) or localized infection.

Individual 7

I7 is the isolated cranium and mandible of a child, approximately eight years of age. Although the skull was found with the mandible in proper articulation, no other skeletal elements of this individual were present. The skull shows no cranial modification. The most unusual feature of I7 is a series of holes in the vault and palate made by a pointed object with a circular cross section. The skull has five entry holes through the vault (fig. 13.12a, b) and one through the center of the palate. The defects on the vault have diameters ranging from 5.0 to 8.5 mm and vary from circular to oval/irregular in form. The holes show classic features of projectile entry wounds (Di Maio 1985), with circular to oval punched-out defects on the external table and irregular, internally beveled exit wounds on the internal table (fig. 13.13a, b). Most of the entry wounds are consistent with an object entering the skull perpendicular to the surface, but one shows a tangential entry, which left a "keyhole" defect (Berryman and Gunther 2000; Dixon 1982), with breakage and leveraging out of fragments on one end of the entrance wound (fig. 13.14). Two metal objects that were found in small burned areas associated with the offering are significant in this context. Both are copper or bronze tubular objects with a hollow open base and a pointed end (fig. 13.15). One is longer (45 mm) and one shorter (32 mm), but both are of similar diameter (9 mm maximum). The function of these objects is unknown, but they may be metal tips that were originally hafted to staffs or spears. Staffs with pointed tips were carried by Aymara *malkus* into the twentieth century. Examples of these staffs can be seen in a

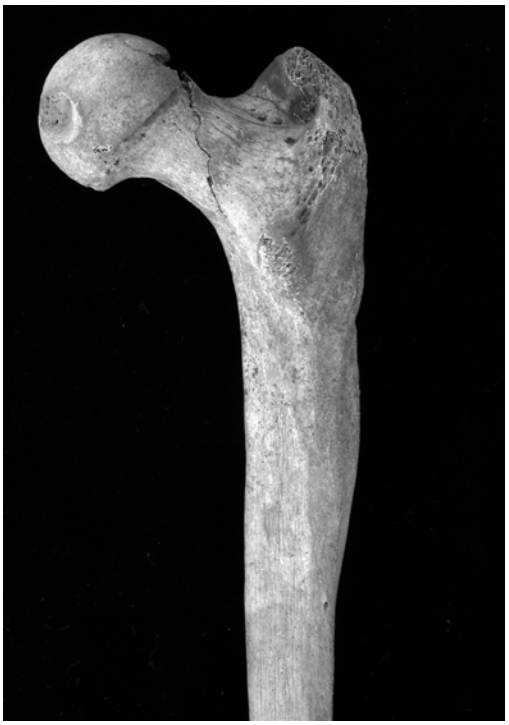

FIGURE 13.10 Posterior view of the proximal end of the right femur of I5, showing pronounced insertion area for the gluteus maximus.

FIGURE 13.11 Localized unremodeled periostitis of the distal end of the right tibia of I6.

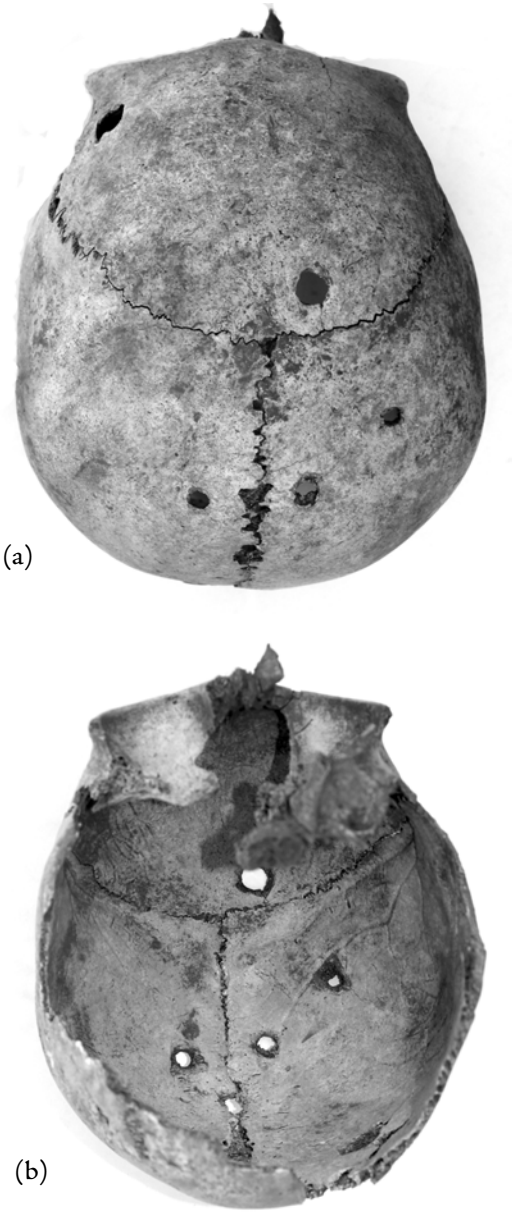

FIGURE 13.12 External (*a*) and internal (*b*) views of the vault of I7, showing five penetrating wounds: two on the frontal bone, two on the right parietal bone, and one on the left parietal bone.

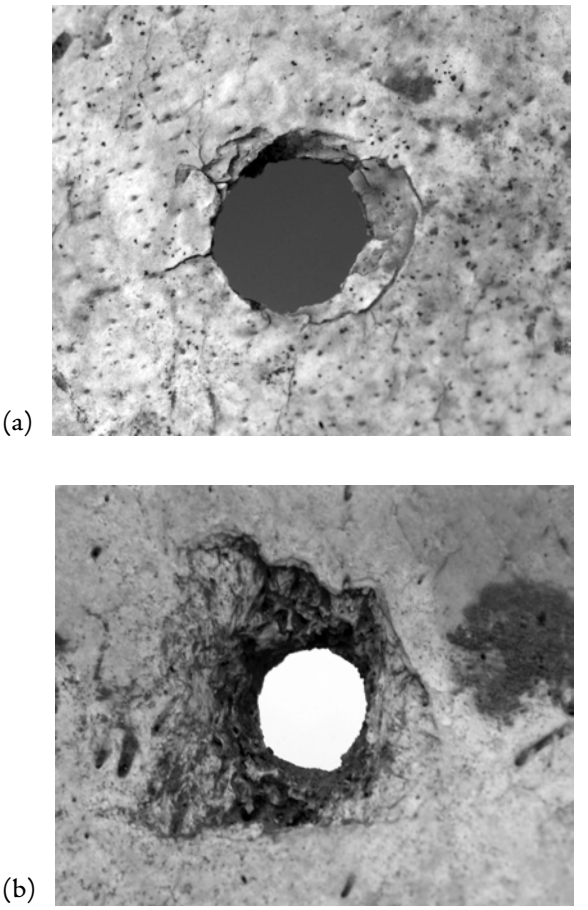

FIGURE 13.13 (*a*) Entrance wound on the external surface of the skull of I7, and (*b*) exit wound on the internal surface.

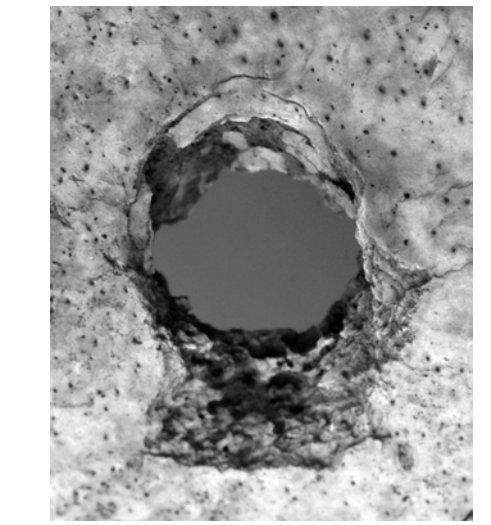

FIGURE 13.14 Tangential entry wound on the skull of I7, showing classic "keyhole" defect.

photograph taken in Bolivia by Max Uhle in 1893 (fig. 13.16).

A metal point similar to the two found with the offering is known from an Inca-period context at Tiwanaku. It was analyzed by Heather Lechtman, who found it to be composed of tin bronze with some arsenic (Lechtman 2003). In contrast to the two found with the offering, however, the example studied by Lechtman had a metal cross

FIGURE 13.15 Copper or bronze pointed objects found in burned areas associated with the offering. Scale is in cm.

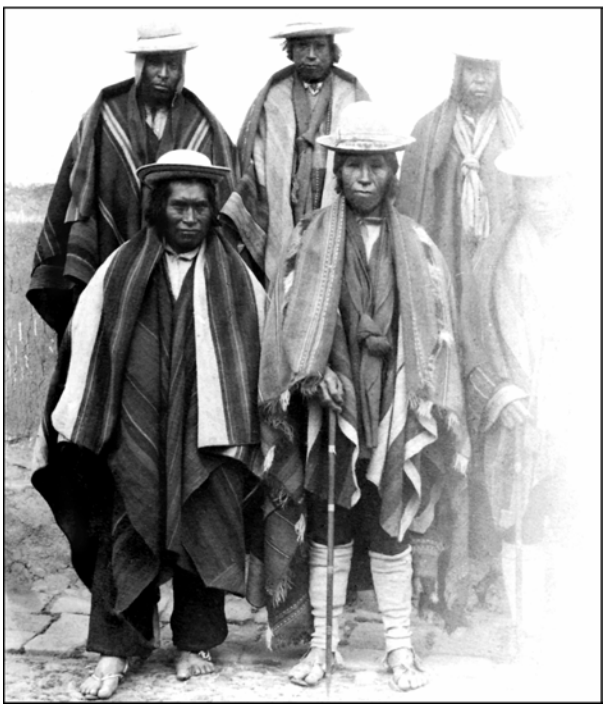

FIGURE 13.16 Photograph taken by Max Uhle in Bolivia in 1893, showing Aymara men holding staffs with pointed ends.

member near its open end. Otherwise it is similar in length and diameter to the two examples shown in figure 13.15. Comparing these possible staff tips or projectile points to the wounds on the skull of

FIGURE 13.17 Longer pointed object placed into one of the penetrating wounds of I7, showing a good match.

I7 reveals a good match (fig. 13.17), suggesting that points like these may have made the holes.

Individual 8

I8 is the partially articulated skeleton of a young adult male. The vertebral column and rib case are articulated, but other bones are jumbled, suggesting that this was a secondary burial. No mandible was found, and several upper incisors were lost postmortem, which is consistent with the reburial of partially decomposed remains. The frontal bone shows flattening, indicating cultural modification of the skull. Skeletal pathologies include a swollen right tibia (the left tibia was not found), which might have been caused by osteomyelitis or treponematosis (fig. 13.18), a healed fracture of the right clavicle, and compression fractures on four mid-lower thoracic vertebrae. In addition, a perimortem fracture was observed on the occipital bone. Externally, there is a 13 mm long linear depressed fracture located just lateral to the external occipital protuberance. The internal table shows a 14 mm diameter blown-out fracture corresponding to the location of the external vault fracture (fig. 13.19a, b).

Individual 9

I9 was assigned to an isolated adult mandible of indeterminate sex that was found beside the cranium of I13. It shows surface deterioration and

FIGURE 13.18 Right tibia of I8, showing inflammation.

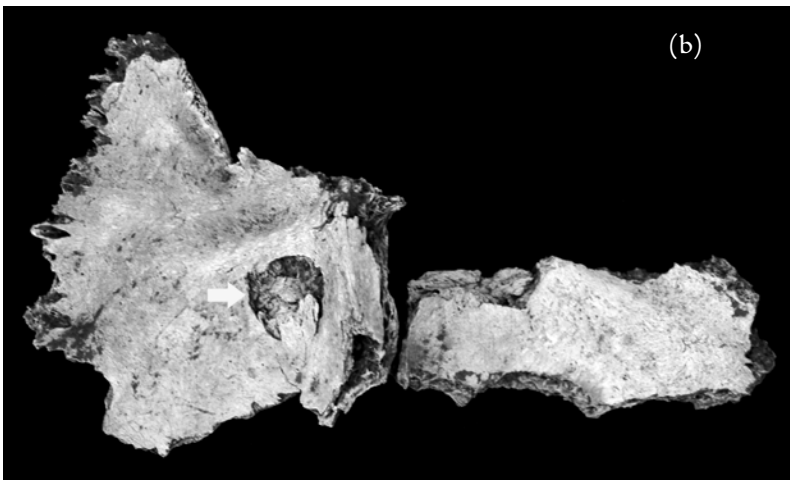

FIGURE 13.19 External (*a*) and internal (*b*) views of the occipital bone of I8, showing a perimortem fracture resulting in the spalling off of bone on the inner surface.

broken teeth, suggesting secondary, and possibly curated, remains.

Individual 10

I10 consists of the left ilium, ischium, femur, tibia, and fibula of an infant. No other bones appear to be associated with these partial remains. Based on the length of the femur (141 mm), age is estimated at approximately one year.

Individual 11

I11 is the complete skeleton of a child approximately four years of age. The skeleton lay face down, with the arms and legs flexed. The skull is

complete and shows no artificial modification. The most unusual finding is an oval defect, 17 by 7 mm, on the left parietal, located 23 mm above lambda and 18 mm lateral to the sagittal suture. A larger bone fragment, 33 by 28 mm, forms one margin of the defect and appears to be a portion of the skull that was broken away when some object penetrated the skull and was then pulled out, leveraging out the fragment. The margins of the broken area show the same soil staining as the rest of the skull, indicating that the breakage is ancient, as well as external beveling, indicating that the piece was fractured from outward force (fig. 13.20a, b).

Individual 12

I12 is the nearly complete skeleton of a young adult male, found lying face down, partially overlain by I5 and Camelid 1 (C1). Based on the length of the left femur, living stature was approximately 171.5 cm, relatively tall for modern highland Bolivians (Stinson 1990). The lower left second molar is abscessed out, but otherwise there is no dental or skeletal pathology except for fractures of the cranium and mandible that appear to be perimortem. Two oval-shaped linear wounds are present on the superior skull vault. The larger defect follows the sagittal suture; the shorter is located on the left parietal bone. Both defects show smooth external borders but jagged and punched-out margins on the internal table, consistent with penetrating wounds caused by blows from a narrow, linear object (fig. 13.21a, b). There is no evidence of any healing of the wound margins, and the jagged fractures of the inner table of the skull are consistent with perimortem wounds. The mandible also shows perimortem trauma in the form of linear

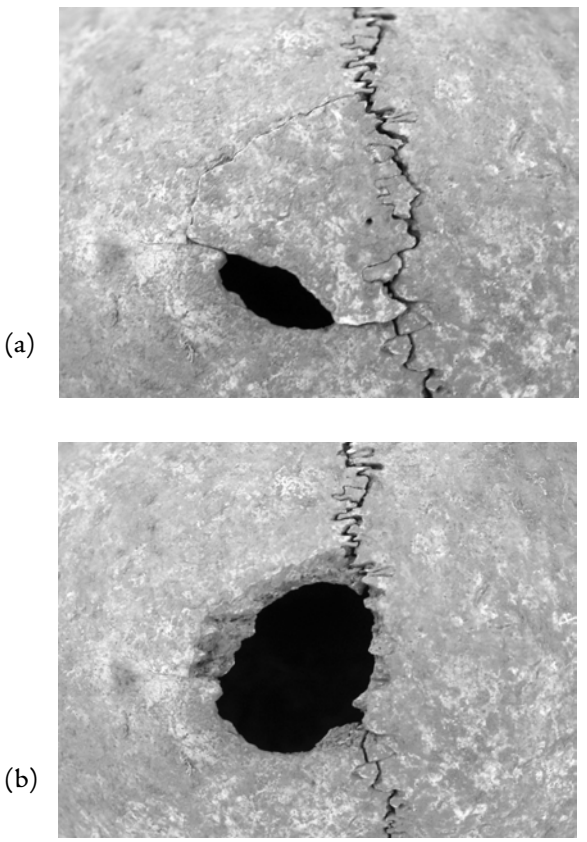

FIGURE 13.20 Penetrating injury to the skull of I11, (*a*) with and (*b*) without a piece of bone that was leveraged out.

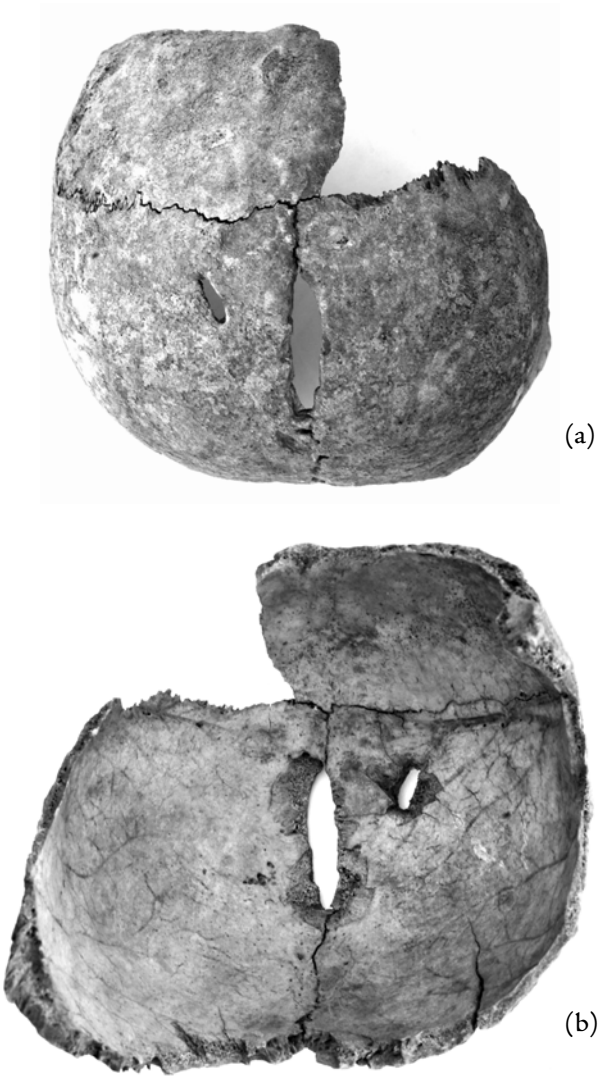

FIGURE 13.21 External (*a*) and internal (*b*) views of punched-out fractures of the skull vault of I12.

FIGURE 13.22 Fracture of the jaw and breaking out of teeth on the midline and right side of the mandible of I12.

fractures of the jaw and the fracturing off of the crowns of multiple teeth (fig. 13.22). Again, there is no evidence of healing, indicating that the fractures occurred around the time of death.

Individual 13

I13 is the mostly complete skeleton of a four- to five-year-old child. It lay on its side to the west of I12, overlain by the skeleton of C1. No skeletal or dental pathology was observed.

Individual 14

I14 is the skeleton of an adolescent about fifteen years old, of indeterminate sex. The skeleton lay on its right side, with the arms and legs flexed. No skeletal pathology was observed. Large enamel hypoplasias are present on the canines, particularly visible on the lower ones.

Individual 15

I15 was assigned to the skull and some ribs of an infant of approximately eighteen months, based on dental development. No pathology was observed.

Individual 16

I16 was a number assigned in the osteology laboratory to an isolated left ilium and ischium of an adolescent female. It could not be associated with any other sets of remains and thus was given its own number. No pathology was noted.

NONHUMAN REMAINS

Two camelid skeletons, one largely complete and the other partial, were directly associated with the human remains (figs. 13.2, 13.4, 13.5). Fragments of camelid, bird, and fish bone—food remains that may be incidental inclusions in the pit fill—were also found in the soil surrounding the offering. All nonhuman bone was analyzed by Kristen Gardella (Verano, Vranich, and Gardella 2006) and will be reported elsewhere. For the purposes of this study, we note only that the two camelids were clearly part of the offering, similar to what has been reported for other human offerings at Tiwanaku. In this case, the more complete camelid (C2) was the first body to be placed into the offering pit, followed by the human remains and the second, partially disarticulated camelid (C1).

DEMOGRAPHIC COMPOSITION OF THE HUMAN REMAINS

Remains of both sexes and of ages ranging from infant to young adult are present in this offering (table 13.1). Infants and children are the most numerous; older adults are notably absent. Among individuals whose sex could be identified, three are males and two are females. Three individuals show cultural modification of the skull in the form of frontal flattening, while two appear to be unmodified. Unfortunately, other skulls from the offering were too fragmentary to assess. It was also not possible to identify with confidence whether the frontal flattening was produced by tabular (boards) or annular (cloth bands) deforming devices, due to the fragmentary nature of most skulls. Blom has found both forms of cranial modification in skulls from Tiwanaku, as well as skulls without cranial modification, and concludes from this that the ancient population at Tiwanaku was ethnically heterogeneous (Blom 2005). This offering deposit appears to reflect this heterogeneity on a very local scale.

Table 13.1 also indicates data on completeness: whether each set of remains was represented by a relatively complete skeleton or not. Nine skeletons were complete or relatively complete; seven individuals (nearly half of the total sample) were represented only by partial remains. The

Table 13.1. Human remains, arranged in order of increasing age at death

Field/ Lab No.	Estimated Age	Sex	Completeness of Skeleton
I 4	6 months	?	Partial
I 10	1 year	?	Partial
I 15	18 months	?	Partial
I 3	3 years	?	Complete
I 11	4 years	?	Complete
I 13	4 years	?	Complete
I 2	7 years	?	Complete
I 7	8 years	?	Partial
I 1	10 years	?	Complete
I 14	15 years	?	Complete
I 16	17–20 years	F	Partial
I 5	18–20 years	M	Partial
I 6	18–20 years	F	Complete
I 12	20–25 years	M	Complete
I 8	Young adult	M	Complete
I 9	Middle adult	?	Partial

complete skeletons show bones in proper articulation, indicating that these bodies were fleshed when placed in the ground. The incomplete remains appear to be secondary burials, removed from some other location after flesh had decomposed. No cut or chop marks were found on these bones that would indicate intentional dismemberment or defleshing of the remains, as has been found in the Akapana and some Akapana East offerings. Nor are any of the incomplete remains arranged as bundles of bones, as are some of the Akapana East secondary burials.

Overall, the combination of articulated and disarticulated remains in this offering indicates that it represents something more complex than a primary burial of recently deceased individuals. However, the commingled nature of the remains and the shallow depth of the deposit, with no evidence of sediment or fill layers separating the human bones, are consistent with a single burial episode. The only clear separation seen in the offering pit was a layer of soil 10–15 cm thick between the first camelid skeleton and the rest of the human and camelid remains. This could represent either some separation in time between the placement of the first and subsequent offerings or perhaps the intentional covering of the first camelid body with a layer of soil before the other remains were placed above it.

COMPARISON WITH OTHER HUMAN OFFERINGS AT TIWANAKU

Table 13.2 compares features of the two forms of human offerings identified by Blom and Janusek with the offering described in this chapter. A number of shared features can be identified, along with some that are particular to one or another type of offering. For example, carnivore damage has been found only on offerings associated with the base of the Akapana, and surface weathering only on bones found on the upper surface of Akapana terraces. Cut marks indicating dismemberment and defleshing of bodies are found in both the Akapana and Akapana East offerings, but not in the offering described here. Bundled secondary burials are known only from the Akapana East offerings.

The most distinctive feature of the offering described here is evidence of violent death. Three individuals show unhealed blunt trauma to the skull, and one has multiple penetrating wounds to the head. The fact that the skull with multiple penetrating wounds lacks an associated skeleton suggests that it may represent a decapitated victim. It is interesting to note that no skeletal remains have been found either at the Akapana or Akapana East with wounds that might indicate cause of death (Blom and Janusek 2004, 127). The cut and chop marks found on many of the Akapana and Akapana East skeletons appear to reflect dismemberment and defleshing of bodies, either as part of a sacrificial ritual, in the case of the Akapana offerings, or as mortuary behavior associated with the secondary burial of ancestors, at the Akapana East (Blom and Janusek 2004, 127).

DISCUSSION

How are we to interpret this new offering and its context? Unlike the human remains found at the base of the Akapana and in the Akapana East, this

Table 13.2. Human offerings at Tiwanaku: comparative analysis

Feature	Akapana	Akapana East	New Offering
Directly associated with architecture	+	+	
Multiple individuals	+	+	+
Single individuals	+	+	
Articulated skeletons	+	+	+
Disarticulated remains	+	+	+
Camelids	+	+	+
Surface weathering	+		
Carnivore damage	+		
Secondary bundled remains		+	
Cut marks from dismemberment, defleshing	+	+	
Violent death: blunt force injury			+
Violent death: projectile injury			+

offering is not directly associated with architecture. Although located near the Akapana and the Kalasasaya, the offering is not directly associated with either of them. In this respect it does not fit the model of dedication ceremonies associated with the construction or termination of ritual architecture, as has been proposed for other human offerings at Tiwanaku.

An alternative explanation for its location and possible ritual significance may be found in its relation to astronomical phenomena, as has recently been proposed by Benítez and Vranich . In recent studies of the alignment of architecture at Tiwanaku and nearby sites, Benítez and Vranich have observed that a beam of sunlight passes through the eastern gateway of the Kalasasaya at sunrise on the winter solstice (June 21), crosses through the Semisubterranean Temple and over the location of the offering pit, and continues directly to the eastern entrance of the Kantatallita complex (Benítez and Vranich 2005). While it may be difficult to prove that the placement of the offering on this axis was intentional, the apparent correlation is intriguing, as it constitutes one more potential element in a growing pattern of astronomical alignments at Tiwanaku (Benítez and Vranich 2005; Vranich 2006).

In summary, this newly discovered offering at Tiwanaku is enigmatic. It contains a heterogeneous mix of age and sex, articulation and disarticulation, and primary and secondary remains. Some individuals show perimortem trauma, but others do not. It appears to reflect a single depositional event, but the mix of primary and secondary remains indicates that individuals buried here died at different times and thus may have been brought from different places. These complexities make it difficult to propose a simple scenario to explain this mass interment. It also suggests that the full spectrum of complexity in human offerings at Tiwanaku has yet to be revealed.

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Chapter 14

Human Skeletal Remains from Bandelier's 1895 Expedition to the Island of the Sun

Christina Torres-Rouff

The Islands of the Sun and Moon are of great significance in Andean prehistory as pilgrimage centers of interregional importance and great temporal depth, ultimately gaining their greatest prestige during the Inca empire (Bandelier 1910; Bauer and Stanish 2001). These islands in Lake Titicaca were considered the birthplace of the founders of the Inca lineage and were of great consequence in Inca sun worship (Bauer and Stanish 2001, 12–13). The Inca were committed to the islands and built substantial sanctuaries on each. Many of these sites had played a ceremonial role before Inca intervention in the area and were, in fact, associated with earlier states (Stanish and Bauer 2004). As such, the availability of a small set of human remains from the Island of the Sun provides the opportunity to explore a unique skeletal collection from this important Andean site.

For four months in 1895, Adolph Bandelier conducted research on the Islands of the Sun and Moon as part of a longer research endeavor in the Andes on behalf of the American Museum of Natural History (AMNH), during which time he acquired a number of the museum's Andean collections. While it is evident that Bandelier excavated a number of cemeteries, the majority of the skeletal collection is highly fragmented, and only a few crania that were in a near-complete state were transported to AMNH.[1] As was common in early archaeological work, few postcranial remains were collected, so this analysis is focused on data that can be obtained from crania. Nevertheless, given the importance of the Island of the Sun in Andean prehistory, documentation of these remains is crucial.

Materials

All thirty-seven crania analyzed in this study belong to adults (table 14.1). The sites from which they were excavated range in date from the Middle Formative (c. 1300–500 BC) through the Altiplano period (c. AD 1100–1400). While only a very small sample, these crania are among the few human remains available for study from the Island of the Sun. None are from the main sanctuary; however, they do provide a glimpse into burial patterns on the island, and through a bioarchaeological analysis, they can provide some insight into individual lives in this important area. Here I provide a description and discussion of skeletal biology, demography, paleopathological indicators, and cultural modifications among these individuals.

Methods

Standard protocols were followed in the collection of bioarchaeological data (Buikstra and Ubelaker 1994). Demographic data were collected from the entire sample. Individuals were grouped into broad age categories based on dental development, tooth wear, and cranial suture closure (Buikstra and Ubelaker 1994, 15–20; Ubelaker 1999, 63–67). Sex was determined using sexually

Table 14.1. Skeletal sample from the Island of the Sun at the American Museum of Natural History

Site	Period*	Males	Females	Indeterminate
Apachinaca	Middle Formative – Altiplano	3	2	0
Ciriapata	Middle Formative, Altiplano	4	3	0
Kea Kollu Chico	Middle – Upper Formative	8	10	0
Kurupata**	Unknown	3	0	1
Sicuyu	Middle Formative, Tiwanaku	2	1	0
	TOTALS	20	16	1

* Periodization is approximate and based on Bandelier's fieldnotes and Stanish and Bauer (2004).

** Possibly Stanish and Bauer Site 105 (Stanish and Bauer 2004, 201, 212).

dimorphic cranial features (Buikstra and Ubelaker 1994, 21–38).

Paleopathology

Paleopathological data were collected to assess quality of life. The duration and magnitude of a stressor in concert with an individual's ability to resist it combine to produce a skeletal response (Goodman and Armelagos 1985). Healthier individuals are often stronger, and therefore capable of surviving stressors for long periods. In contrast, individuals who succumb quickly to disease may do so without skeletal reaction, and their skeletal remains may appear healthy. Many bioarchaeologists have argued that the most fruitful approach to this "osteological paradox" is consideration of all possible contextual information and the use of evidence from multiple, independent data sources to test alternative hypotheses concerning the health of prehistoric populations (Goodman 1993; Steckel and Rose 2002; Wood et al. 1992; Wright and Yoder 2003).

Data were collected on several indicators of generalized stress and systemic disorders, including linear enamel hypoplasia, porotic hyperostosis, and cribra orbitalia (Buikstra and Ubelaker 1994). Linear enamel hypoplasia results from specific episodes of acute stress during periods of growth (Goodman and Armelagos 1985; J. Rose, Condon, and Goodman 1985). Hypoplasias are generally pits or linear defects that arise during enamel formation, a process that is especially sensitive to physiological disruptions. This commonly studied indicator is a permanent marker of systemic stress, as enamel does not remodel over a lifetime. The occurrence and severity of these on the buccal surface of the incisors and canines were recorded (Buikstra and Ubelaker 1994, 56–58).

The location, expression, and aspect of the lesions associated with porotic hyperostosis and cribra orbitalia were documented as reflections of anemia, nutritional deficiencies, or generalized stress (Buikstra and Ubelaker 1994, 120–21; Walker et al. 2009). The frequency of these juvenile conditions on the cranial vault and orbital roof is an indication of a diet that is low in iron-rich foods such as meat, as well as the loss of iron as a result of diarrheal disease and parasite infections (Stuart-Macadam and Kent 1992; Walker 1986). Porotic hyperostosis was recorded when porosity with coalescing foramina was apparent on the ectocranial surfaces of the cranial vault and/or on the superior surface of the orbits (cribra orbitalia).

In order to examine activity patterns and body use, data were collected on osteoarthritis. Osteoarthritis is a degenerative disease of the joints resulting from mechanical stress and physical activity (Larsen 1997, 161–94). On these crania it was recorded at the temporomandibular joint as well as the occipital condyles. Finally, traumatic injuries, either accidental or due to intentional violence, can provide information about one's environment, including social conditions and activity patterns (Buikstra and Ubelaker 1994, 119–20; Walker 1989, 1997). It has been argued that cra-

nial trauma and weapon wounds provide the strongest evidence for interpersonal violence, while postcranial trauma is frequently associated with accidental injury or work stress (e.g., Alvrus 1999; Standen and Arriaza 2000). Cranial trauma was examined by noting the shape of the injury, location, and state of healing in order to assess patterns of interpersonal violence.

Cultural Features

Additional data were collected on two cultural interventions to the body. The first is trepanation, which is the surgical removal of a portion of the cranial vault. Motives for this practice are generally unknown but may reflect medical intervention around traumatic injury (Andrushko and Verano 2008). Trepanations are usually performed using three distinct methods: grooving, scraping, or drilled holes, or occasionally a combination of these (Aufderheide and Rodríguez-Martín 1998, 33; Verano 2003b). Trepanation was recorded in both a presence and absence fashion, as well as with a description of the techniques and state of healing. The second cultural feature that was recorded is intentional cranial vault modification, which is often interpreted as a sign of group identity or ethnicity in the Andes (Blom 2005; Hoshower et al. 1995; Torres-Rouff 2002, 2009). In the Andean area, there are two common forms of deliberate head shaping. The first, annular, involves circumferential pressure on the skull, resulting in a narrow, elongated shape. The second, tabular, is caused by pressure exerted on the front and back of the skull, allowing for parietal expansion (fig. 14.1); Dembo and Imbelloni 1938). Presence was determined based on the visibility of the modification, given its importance as a cultural signifier. In order to further elucidate differences in the practice, crania were also classified into erect and oblique variants based on the angle of the posterior of the skull.

RESULTS

Paleopathology

The osteological markers of health considered here suggest that there is some range of health status in this sample. This should not be a surprise, given the distribution of sites and time periods. Only one individual (99/393), a male from Kea Kollu Chico, had evidence of enamel hypoplasia, which was observed as a nonlinear array of pits. However, there was an incredibly high rate of postmortem tooth loss (86.5 percent) in this sample, which is not surprising given the length of time that the remains were curated. It is probable that other individuals with hypoplasia were not observable. Low levels of cribra orbitalia (3/37, or 8.1 percent) and porotic hyperostosis (2/37, or 5.4 percent) were also noted in the sample. Cribra orbitalia was seen in two females (an adolescent, Kea Kollu Chico 99/382, and an adult, Sicuyu B/2235) and one adult male (Ciriapata B/2288); the adolescent female (99/382) had

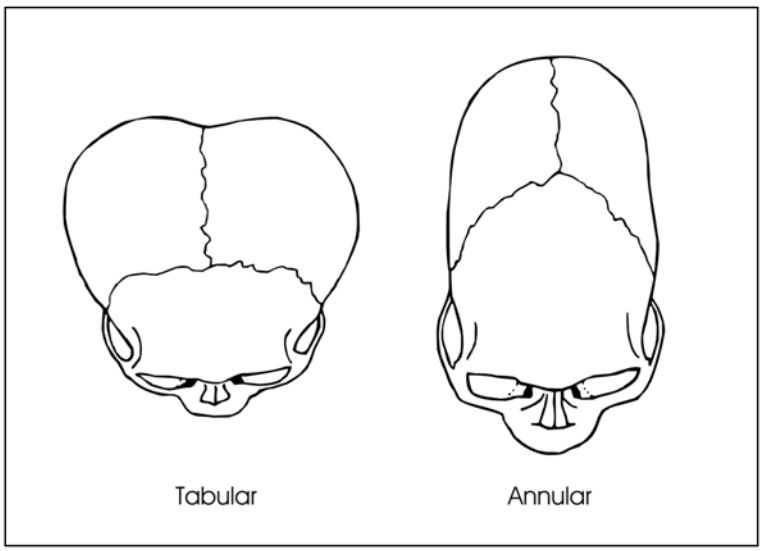

FIGURE 14.1 Basic forms of cranial vault modification in the Andes (*after Antón 1989*).

evidence of active pathology, while the other two displayed remodeled lesions as is common in adulthood. Porotic hyperostosis was documented in one adult male (Apachinaca B/2182) and one adult female (Kea Kollu Chico 99/391). In both cases it was noted as porosity on the occipital bone, but there were no clear signs that this porosity resulted from the pressure of cranial modification, although it should be noted that there was no correlation between the presence of cribra orbitalia and porotic hyperostosis in this sample. Finally, osteoarthritis was only noted on the cranium of one adult male (B/2288; 1/37, or 2.7 percent); this individual also suffered from cribra orbitalia.

In contrast, trauma rates in this sample were considerably higher. Twenty-one percent of the population (8/37; females: n = 3; males: n = 5) showed evidence of ten healed cranial traumas, with two individuals displaying multiple fractures (table 14.2). There was no evidence of perimortem trauma (injuries obtained at or around the time of death). Most traumas were clustered on the frontal and nasal bones, with the left parietal being the only other bone affected. Half of the sample displaying cranial trauma was from the site of Kea Kollu Chico.

Cultural Features

Four individuals in this sample (4/37, or 10.8 percent) showed evidence of trepanation, all of whom were from the site of Kea Kollu Chico. This was distributed among two males (B/2302, 99/419) and two females (B/2301, B/2303). In each of these cases, trepanation was performed using a scraping method, gradually exposing the contents of the cranial vault (fig. 14.2). Two individuals (one male, one female) showed no evidence of healing, although the female (B/2301) demonstrated evidence of healed cranial trauma. A relationship has been documented between cranial injury and trepanation elsewhere in the Andes (Andrushko and Verano 2008). The second female had a trepanation that had begun the healing process, while the final cranium, an adult male, was completely healed, providing evidence for long-term survival. In his notes, Bandelier writes of at least seven other trepanned cranial fragments from the site of Kea Kollu Chico (B/2313, B/2315 [four fragments], B/2453, B/2454) but gives no indication of trepanning at the other sites on the island.

As regards deliberate head shaping, it is noteworthy that there were no unmodified crania in the sample, although this may reflect a sampling bias. All thirty-seven individuals in this collection had moderate to pronounced annular modification (fig. 14.3). The consistency is striking, as is the fact that all the modifications were highly symmetrical, implying some degree of standardization of the practice. The majority of the forms were of the oblique variant (n = 27; 73 percent); the remaining ten crania were erect. There were no significant differences between males and females in type of modification ($\chi^2 = 0.600$, $p \leq 0.439$, ns).

Table 14.2. Trauma patterns in the sample from the Island of the Sun

Site	Catalog #	Sex	Location
Koropata	B/2176	M	Right frontal
Apachinaca	B/2179	M	Left frontal
Sicuyu	B/2235	F	Left frontal and center frontal (at bregma)
Sicuyu	B/2237	M	Right frontal and left nasal bone
Kea Kollu Chico	B/2301	F	Right frontal
Kea Kollu Chico	B/2312	M	Both nasal bones
Kea Kollu Chico	B/3067	F	Left parietal
Kea Kollu Chico	99/434	M	Left frontal

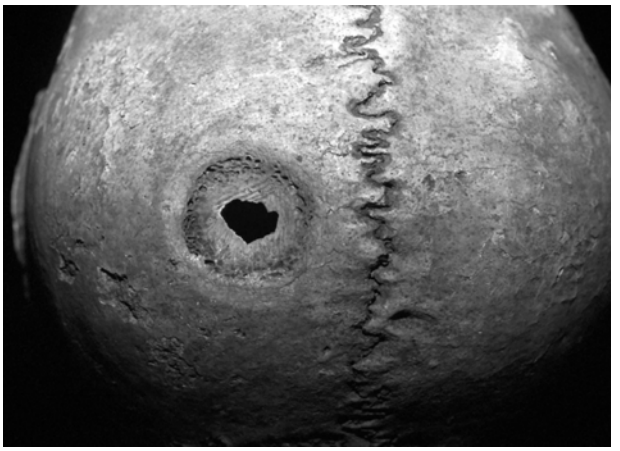

FIGURE 14.2 Trepanation from the Island of the Sun (Kea Kollu Chico B/2301, adult female).

FIGURE 14.3 Annular oblique cranial vault modification from the Island of the Sun (Sicuyu B/2237, adult male).

COMPARATIVE SAMPLES

The data from the Island of the Sun were compared with crania from two other sites in the Bolivian altiplano, Kupa Pukio Chullpa and Tama Tam Chullpa. These sites are located about 90 km southeast of La Paz. They were occupied during the Late Intermediate period, a time characterized by the rise of independent Aymara polities after the fall of the Tiwanaku state. Bandelier collected human remains from these sites in 1897, taking hundreds of crania from multiple *chullpa* complexes to AMNH. For this study, I examined the 131 individuals excavated from Kupa Pukio Chullpa and a random sample of 106 individuals from the available 230 from Tama Tam Chullpa.

Examination of these crania reveals both similarities and differences with those from the Island of the Sun (table 14.3).[2] As regards paleopathological indicators, there are no significant differences between the sites in porotic hyperostosis. However, there are significant differences in the rates of cribra orbitalia ($\chi^2 = 9.609$, $p \leq 0.008$) and cranial trauma ($\chi^2 = 7.449$, $p \leq 0.024$). Despite the low rates, cribra orbitalia is more frequent on the Island of the Sun than at either of the other sites. Cranial trauma rates are nearly the same at the Island of the Sun (8/37) and Kupa Pukio Chullpa (26/128); however, they are much lower at Tama Tam Chullpa (9/106). Finally, the Island of the Sun has significantly higher rates of trepanation ($\chi^2 = 12.009$, $p \leq 0.002$) than either of the Chullpa sites. As alluded to above, this may be an artifact of the collection strategies employed by Bandelier when he was on the island.

In terms of the cultural feature of head shaping, there are no significant differences among the three sites in either presence ($\chi^2 = 1.156$, $p \leq 0.561$, ns) or type ($\chi^2 = 1.819$, $p \leq 0.769$, ns) of cranial modification (table 14.4). Interestingly, there is no evidence for tabular forms of modification at any of the sites, again suggesting standardization of the practice. The two chullpa sites

Table 14.3. Comparison of bioarchaeological data from the Island of the Sun, Kupa Pukio Chullpa, and Tama Tam Chullpa

	Island of the Sun	Kupa Pukio Chullpa	Tama Tam Chullpa
Cribra orbitalia	8.33%	0.78%	0.94%
Porotic hyperostosis	5.40%	6.20%	4.72%
Cranial trauma	21.62%	20.31%	8.49%
Trepanation	10.81%	0.76%	1.89%

Table 14.4. Comparison of cranial vault modification data from the Island of the Sun, Kupa Pukio Chullpa, and Tama Tam Chullpa

	Island of the Sun		Kupa Pukio Chullpa		Tama Tam Chullpa	
Absent	0	0.00%	1	0.76%	2	1.89%
Annular erect	10	27.02%	28	21.37%	26	24.52%
Annular oblique	27	72.98%	102	77.86%	78	73.58%

considered here also demonstrate a predominant use of the oblique variant. The data reveal tremendous consistency between the sites. Some early scholars considered the overwhelming presence of modification and the monolithic use of annular forms as typical of the altiplano (i.e., Dembo and Imbelloni 1938; Marroquin 1944). While this may not be true for earlier periods (e.g., Blom 2005), these data support the possibility that annular forms were ubiquitous in the Late Intermediate period.

DISCUSSION

This analysis of crania from the Island of the Sun reveals a relatively healthy population as far as can be determined from these limited skeletal remains. There is evidence of nutritional deficiencies in youth in the form of cribra orbitalia, porotic hyperostosis, and enamel hypoplasia. However, few individuals suffered visible long-term effects from these conditions, and there were no distinguishing factors to separate affected crania from others on the island. Both sexes were represented in the sample, and no particular site showed significantly greater evidence of pathology. It is of note that the individuals with porotic hyperostosis showed no relationship to those individuals bearing signs of cribra orbitalia. It has been speculated that porosity of the cranium, particularly near lambda, can result from the binding of the skull in childhood; however, it is typically associated with tabular forms of cranial modification. Gerszten attributes these lesions to necrosis caused by the pressure of the deforming apparatus (1993, 94–96), although there is disagreement as to the causes of this porosity. Previous research suggests that it was innocuous in nature (Allison et al. 1981; Blom et al. 2005; Gerszten 1993).

In contrast to the indicators of nutritional pathologies, rates of healed cranial trauma are surprisingly high. These nonlethal traumas do not point to moments of substantial violence. The distribution of these injuries between the sexes suggests that these patterns are not indicative of warfare, although there is a possibility that they are associated with raiding (Alvrus 1999). The location of most injuries on the anterior of the crania suggests face-to-face confrontations between individuals (fig. 14.4). Lambert (1994) has suggested that this type of pattern reveals conflicts that followed a protocol about rules of engagement. Other studies conducted in the pre-Columbian Andes have suggested the possibility of ritualized violence in contexts such as this (Kellner 2002; Orlove 1994; Standen and Arriaza 2000). Among the points used to make these claims is the location of the majority of the injuries on the frontal and facial bones, a pattern that is in concordance with the data presented here.

Contemporary accounts from Peru discuss a ritual battle called Tinku, where wounding one's opponent was the goal (Orlove 1994). Of more relevance here, Bandelier (1910) describes annual events on the Island of the Sun wherein men engaged in regular hostilities that involved throwing sling stones. Women participated in this by providing stones kept in their skirts to men, which could suggest the possibility of injuries across both sexes. The result of this is that "a number are badly wounded and now and then some are killed . . . but still [the contests] are renewed annually" (Bandelier 1910, 88). He also notes other annual battles between members of different communities on the island. This form of conflict resolution may have existed on the Island of the Sun in prehistoric times as well. If this were a traditional

FIGURE 14.4 Healed fracture to the frontal bone (Kurupata B/2176, adult male).

form of combat among highland peoples, it would help to explain the high rates of face-to-face nonlethal violence in this archaeological sample. Nevertheless, this is purely speculative, especially given the broad temporal range occupied by the sample and the fact that there is no clear cause for the violence patterns seen in this varied sample.

The high incidence of trepanation is also interesting, although, as noted earlier, it may reflect a collection bias. Trepanation is only seen at Kea Kollu Chico, which also had the highest rates of cranial trauma in the sample. Scholars have noted that in the Andes, trepanation is occasionally associated with skull fractures (Andrushko and Verano 2008; Verano 2003b). In this sample from the Island of the Sun, trepanation seems to show no relationship to cranial trauma, although it is possible that the affected bone was excised by the surgery. It is unknown why this practice was more common at one particular site on the Island of the Sun. As mentioned earlier, Bandelier's fieldnotes do not suggest evidence of trepanation elsewhere on the island.

Cranial vault modification patterns demonstrate an overarching homogeneity across sites and time periods. It is rare that an individual from this area was unmodified; moreover, there is a strong tendency toward the use of annular oblique forms of modification. The use of cranial modification as a signifier of group identity in the Andes could speak to the possibility that the identity being conveyed in the altiplano region is larger than that of each individual or their community.

CONCLUSION

In sum, this study has revealed a population with relatively little skeletal evidence of nutrition and disease stress. Additionally, this group demonstrates a head-shaping pattern that suggests cultural homogeneity with the larger altiplano population. However, it also reveals a society that underwent periods of violence and may support the notion that cranial injury is tied into the presence of trepanation. Comparison with remains from Kupa Pukio Chullpa and Tama Tam Chullpa support the idea that cultural patterns throughout the altiplano were significant, given the many similarities among the sites, despite the Island of the Sun's very different historical trajectory.

ACKNOWLEDGMENTS

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NOTES

1. Bandelier also shipped back a series of skeletal fragments that are not examined in this paper.
2. Statistics were not calculated for enamel hypoplasia given the dearth of available anterior teeth in these collections.

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