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MAYAN CITIES OF YUCATAN  
SETTLEMENT PATTERNS AND STRUCTURE TYPES

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OBlici NASELJA I VRSTE GRAĐEVINA

PREGLEDNI ZNANSTVENI ČLANAK  
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FIG. 1 CHARACTERISTIC STRUCTURES OF A MAYAN CITY, MAYAPAN  
SL. 1. ZNAKOVITE GRADEVINE MAJANSKOG GRADA, MAYAPAN



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## MAYAN CITIES OF YUCATAN SETTLEMENT PATTERNS AND STRUCTURE TYPES

## MAJANSKI GRADOVI YUCATANA OBLICI NASELJA I VRSTE GRAĐEVINA

MAYAN CITIES  
MAYAN STRUCTURES  
MAYAS AND ASTRONOMY  
MAYAS OF YUCATAN  
MESOAMERICAN SETTLEMENTS

GRADOVI MAJA  
GRAĐEVINE MAJA  
ASTRONOMIJA MAJA  
MAJE YUCATANA  
NASELJA SREDNJE AMERIKE

The research results on prehistoric Mesoamerican settlements in Mexico are presented through the planners', rather than the archeological, point of view. Numerous settlement types and sizes were analyzed by comparing the archeological data and the personal experience gained during the research *in situ*. Even though the cities were unplanned, derived results proved the astonishingly high level in the construction of structures and buildings in relation to astronomical phenomena.

Rezultati istraživanja srednjoameričkih prapovijesnih naselja na području Meksika prikazani su s planerskog, a ne arheološkog gledišta. Vrsta i veličina naselja istražena je uspoređujući postojeće arheološke rezultate s osobnim doživljajem pojedinih lokaliteta pri njihovom obilasku *in situ*. Dobiveni rezultati pokazuju da, iako je većina gradova nastala neplanski, postoji vrlo veliki stupanj promišljanja kod gradnje građevina na temelju astronomskih promatranja.

## INTRODUCTION

### UVOD

This paper represents preliminary results reached during the scholar research on prehistoric Mesoamerican settlements development in Mexico, that was conducted during scholar visits to the Universidad Juárez Autónoma de Tabasco, Villahermosa, Tabasco (2016) and Anahuac-Mayab University, Merida Yucatan (2018).

The Mesoamerica<sup>1</sup> covers the area of today's countries of Mexico, Guatemala, Belize, western parts of Honduras El Salvador, Nicaragua and Salvador (Fig. 2). The human presence within the area can be observed ever since some 22,000 years ago: numerous singular groups of humans, not yet connected to anything larger than a tribe. The first Mesoamerican large cultural group that can be called a civilization are the Olmecs<sup>2</sup> whose members built settlements in tropical lowlands of south-central Mexico, today's states of Tabasco and Veracruz.

### PRE-MAYAN EPOCH

#### PREDMAJANSKO DOBA

The oldest known Olmec site is San Lorenzo<sup>3</sup> (Veracruz state), occupied around 1,500 BC, and which is considered to be one-of-the-oldest populated places in both Americas. Besides this one, there were two other Olmecs' settlements: La Venta and Tres Zapotes (Fig. 2). The site of San Lorenzo itself, originally an island within a river, was naturally elevated above the river flow level on a

secure height enough to protect it from frequent flooding and the attack of the enemy. The site itself had a very diverse shape: several small hilltop villages ruled by San Lorenzo urban center government, which faced its decline at 900 BC. The most recognizable remnants of the Olmecs culture are the colossal stone heads (Fig. 3) up to 3 meters of height, representing human heads that might represent the ruler's heads. The other structures found and considered to originate from Olmecs are stone aqueducts built of hundreds and thousands of basalt carved blocks (brought from nearly a 100 km distance) laid in a continuous slope that provided the constant flow of water from the source to the final point. San Lorenzo is not as famous as some of the Mayan sites in Mexico, but surely is a significant historical and cultural center and archaeological site as the Olmecs are considered to be the "parent" culture that Mayas arose from.

The other site – La Venta (Tabasco state), was inhabited between 1,200 BC and 400 BC and served as a civic and a ceremonial center (proved by a large number of buried offerings, tombs, *stelae* and altars dispersed among the earthen mounds and platforms on the site. La Venta is considered to be the first "planned" pre-Hispanic settlement. The dominant structure is a conic mound (which initially might have been a stepped pyramid that changed its shape due to the erosion), 30 meters of height (*Complex C*). This mound is considered to be one of the oldest earthen pyramids in Mesoamerica. North of it, there is a *Complex A* consisting of two ridge mounds

<sup>1</sup> COE, KOONTZ, 2008: 12. German ethnologist P. Kirchhoff was the first one to introduce this term. He recognized certain similarities existing among the pre-Columbian cultures in this geographic area with many interrelated cultural similarities resulting from 1000 years long inter and intra-regional interaction.

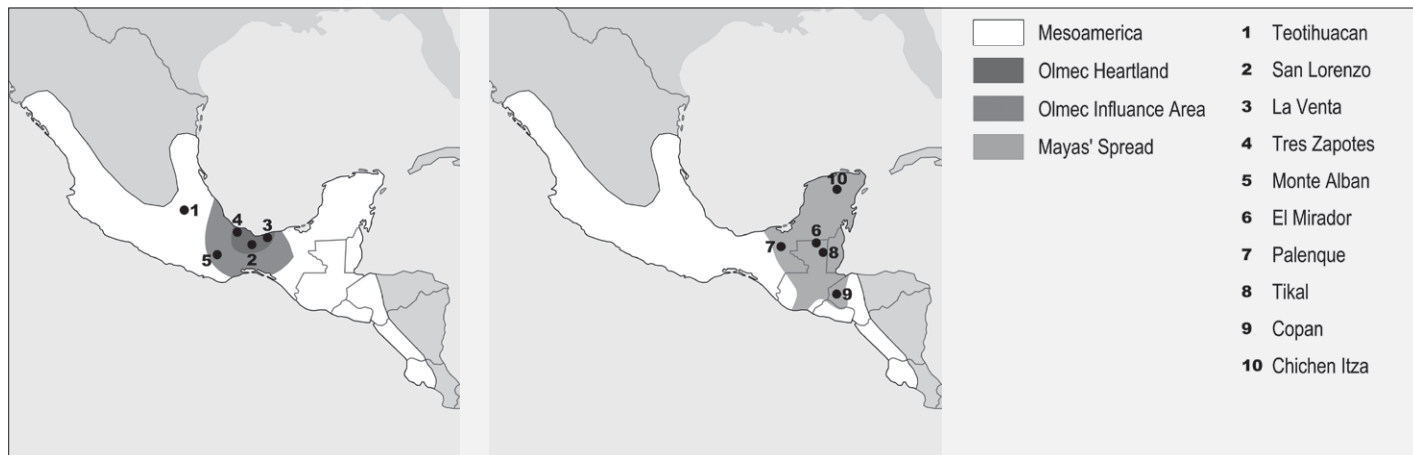
<sup>2</sup> R. DIEHL, 2004 set the Olmecs' first appearance in Mesoamerica between 1,600 and 1,500 BC, although some traces of their origin can be found in farming tribes in Tabasco (5,100-4,600 BC).

<sup>3</sup> The site was first occupied in the mid of the second millennium BC with a peak between 1,200-900 BC. The occupied area was built-up with temples, plazas, causeways, and structures for the elite with the population up to 1,000.

<sup>4</sup> LIPOVAC, 2010: 275

<sup>5</sup> In the Preclassic period, this group had a dominant structure flanked by two smaller inward-facing structures, built on a platform. One of the largest *Triadic groups* is the one in *El Mirador*, Guatemala.

<sup>6</sup> The American anthropologist and astronomer, A.F. Aveni suggested in his article on *Building J* [AVENI, 2001] that the shape and orientation of the *Building J* might have some astronomical reasons as its pentagonal arrowhead shape concurs with the *Auriga* constellation. If its axis is traced backward perpendicular to the rear wall, towards a small marker found on a temple structure (*Building P*), the axis is aligned with the rising point of the *Capella* (the brightest star of the *Auriga* constellation) between 275 BC and 100 AD (assumed period of the *Building J* construction).



forming central plaza with a certain number of tombs, three smaller mosaics representing jaguar masks and a small round-shaped mound – a tomb (Fig. 4). South of the mound, there is a *Complex B* – a larger plaza (100 by 400 m) with numerous small platforms (with noble residents' houses or for ceremonial or ritual purposes), *stelae* and altars. The main structures (ridge mounds, plazas...) in La Venta have a deviation of some 8 degrees in correspondence to the north-south axis (like most of Olmecs' sites), the reason for which is still unclear.

Another pre-Mayan culture, Zapotecs, built their capital Monte Alban on a hill slope, near-by today's city of Oaxaca in Oaxaca valley (Fig. 5) some 200 km SW of San Lorenzo and populated between 500 BC and 800 AD. The site was a result of vast earthwork labor that transformed the hill slopes into a flattened mountaintop (some 400 meters above the valley) for the construction of stone structures (pyramids, temples, and palaces) around large ceremonial plaza of a size 200 by 300 m, overlooking the valley. The whole complex was nearly 20 hectares large. The site position suggests that it was meant mainly for the upper class, while the rest of the residents lived down in the valley. Scholars estimate that it was a home for nearly 15,000 people in 200 BC, and almost 25,000 residents at around 800 AD when the decline of population occurred. North and south of the main plaza, there are two platforms that could be accessed along the wide stairways. The *North platform* has a sunken patio and four structures (*Building B, D and E*, and a small Temple – *Temple of the two Columns*). The South platform looks like a huge flat-topped mound<sup>4</sup> with a small one of the same shape on the top. Along the plaza east edge, there are five structures atop an elongated platform, while on the plaza west edge there are three structures (*Building of the Danzantes* and two structures *K and M*), but with-

out a platform. The shape of a structure with in *System IV* (a stepped flat-topped pyramid) has similarities with Teotihuacán architecture – stepped pyramid with curved sloping sides. Within the plaza itself, there are 4 structures: three are a part of the *Triadic group*<sup>5</sup> (*Buildings G, H and I*) while the fourth one, *Building J* is a very enigmatic one because of its shape and orientation: an irregular pentagon that is rotated for 45° compared to the direction of all other buildings. It was built around 275 BC, but its purpose and reason for its orientation is still a mystery.<sup>6</sup>

Today, many scholars consider the Olmecs to be the mastermind who "invented" the ritual practice like human sacrifice and blood-letting, ballgame, astronomy, writing system (lately developed into Mayan glyphs) that are Mayan culture well-known attributes.

## MAYAN EPOCH

### MAJANSKO DOBA

Opposed to the highly centralized power and urban centers of Olmecs, the Mayans from Mexico had several "kingdoms" established over today's Mexico states (Yucatan, Campeche, Quintana Roo, partly Tabasco and Chiapas) and Belize, Guatemala, El Salvador and west Honduras. They were the largest group in this part of the World at that time. They were spread over the area of nearly 350,000 km<sup>2</sup> (Fig. 2) and organized in smaller groups

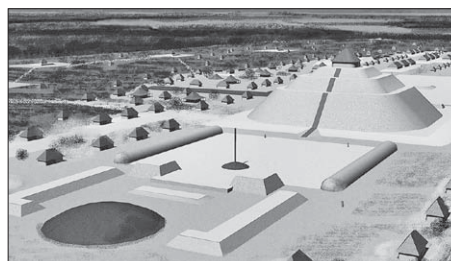


FIG. 2 MESOAMERICA AND THE AREAS POPULATED BY OLMECS AND MAYANS

SL. 2. SREDNJA AMERIKA I PODRUČJA NASELJENA OLMECIMA I MAJAMA



FIG. 3 ONE OF THE STONE HEADS, TODAY EXIBITED IN LA VENTA PARK, VILLAHERMOSA, TABASCO

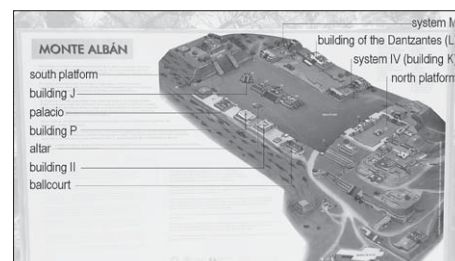
SL. 3. KAMENA GLAVA IZLOŽENA U PARKU LA VENTA, VILLAHERMOSA, TABASCO

FIG. 4 3D VISUALIZATION OF LA VENTA SETTLEMENT, VERACRUZ

SL. 4. PROSTORNI PRIKAZ NASELJA LA VENTA, VERACRUZ

FIG. 5 3D VISUALIZATION OF MONTE ALBAN WITH MARKED MAIN STRUCTURES

SL. 5. PROSTORNI PRIKAZ NASELJA MONTE ALBAN S OZNAČENIM GLAVNIM GRADEVINAMA



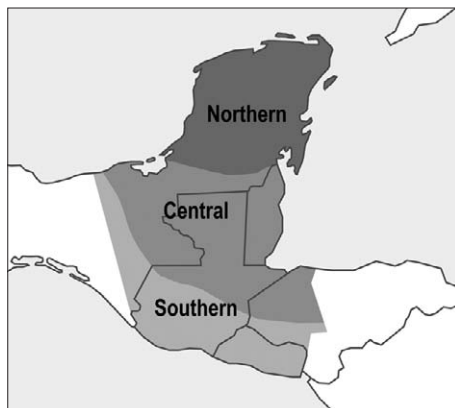


FIG. 6 APROXIMATE DIVISION OF MAYAN TERRITORY  
SL. 6. PRIBLIŽNA PODJELA MAJANSKOG PODRUČJA

divided by different customs, languages<sup>7</sup>, and historical background, but still had much in common. That's why the scholars observe them as a single cultural group. This region can be divided into two different relief areas: *Highlands* and *Lowlands*<sup>8</sup> but following the geographic attributes, there are three distinct areas: *Southern*, *Central* and *Northern* one (Fig. 6). On the other hand, Mayans' history can be observed through 3 principal periods (more chronological, rather than based on cultural evolution degree): the *Preclassic*, *Classic*, and *Postclassic*, preceded by the *Archaic* Period (during which the first settlements and early agriculture development could be noted).

**Preclassic period (1,800 BC – 250 AD)** – The Mayan civilization started around 2,000 BC in Cuelo (Belize), but the first sedentary settlements were established around 1,800 BC in Chiapas state (Mexico) when nomad groups commenced with the cultivation of maize, beans, squash. Around 1,000 BC, some growing villages became urban centers, and by 400 BC in the *Southern Area* a large ritual center Kaminaljuyu (Guatemala) was established, on both sides of a longitudinal plaza having several flat-topped pyramids with temples atop. Much of the art-work (*stelae*, altars) expressed a considerable similarity with Olmecs. In the *Central Area* (northern Guatemala), between 200 BC and 150 AD, a city of El Mirador was built, having a population of nearly 100,000 at its peak. Around the large central square, there were many structures, out of which a large central pyramid with two adjacent structures is worth mentioning. El Mirador was connected with other cities in the region by numerous *sacbes*.

**Classic period (250-900 AD)** – This period was marked by the large-scale construction, urban planning, and cities with a population between 50,000 to 120,000. Teotihuacan had

a significant influence over the first cities (like Monte Alban or Tikal in Guatemala). Owing to this influence, Tikal became one of the most powerful cities in Central Lowlands (200-900 AD). Besides cities and large stone structures (built without any machinery – using just the manual labor), the Mayas learned how to cultivate maize, beans, squash and developed a complex understanding of astronomy. They introduced one of the world's first written languages – a language made of 5-600 glyphs<sup>9</sup>, that was used up to the arrival of the Spaniards. The Mayan texts were inscribed on stone monuments, lintels, *stelae*, and ceramics, but it was also "painted" on a paper produced from tree-bark. Set of these "writings" are known as *Codicices*. Even in mathematical skills, the Mayans were one-of-a-kind civilization.




Along with other Mesoamerican civilizations, they used a numerological system with a base of twenty. The digits were shown in a bar-and-dot presentation<sup>10</sup>, but in the Late Preclassic period (350 BC – 250 AD) the Mayans added another symbol, a symbol for a zero.<sup>11</sup> They "measured" time using two complicated calendars.<sup>12</sup> Unfortunately, during the 9<sup>th</sup> century AD, the Central region suffered major political collapse (abandonment of cities, ending of dynasties...) followed by warfare, overpopulation, and drought. These developments increased the urban activity in

<sup>7</sup> All Mayan languages (nearly 70 of them) belong to a sizeable linguistic family originating from the one spoken in the western Guatemala region, some 5,000 years ago and some of them are still in use today.

<sup>8</sup> PHILIPS, 2007: 46

<sup>9</sup> HELMKE, KETTUNEN, 2005: 12. Each glyph represented a word or a syllable and could be combined with the others in an almost infinite number of ways. That is why each Mayan word could have been written in many different ways.

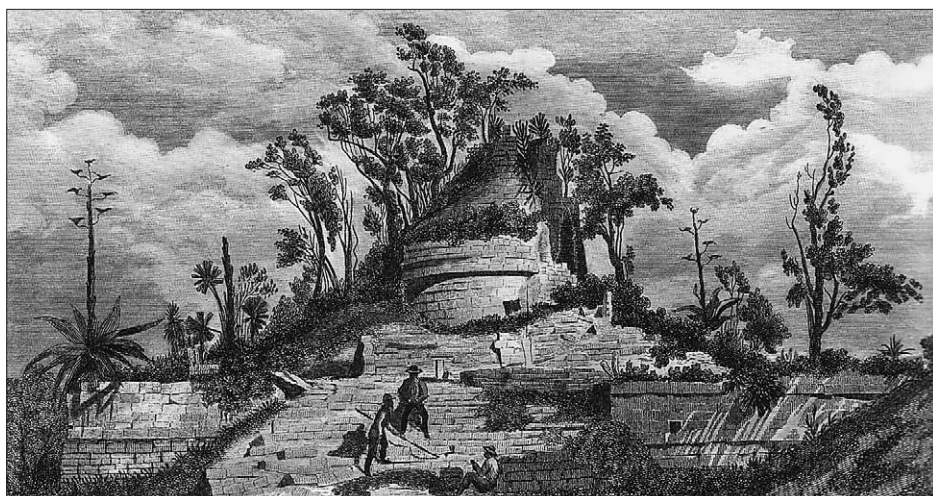
<sup>10</sup> GARZA, 1994: 31. Three symbols presented all digits: a dot (value of 1), a bar (5) and a (turtle-like) shaped shell (0). The numbers were written in horizontal lines in a *vigesimal* system. Numbers between 20 and 399 were shown in the second line, numbers between 400 and 7999 in the third line (from the bottom line upward), etc.; e.g., the number 2018:

4005		5×400
205		0×20
15		18×1
		2018

<sup>11</sup> Along with the Babylonian numerical system, this was the earliest known appearance of an explicit zero sign worldwide. At first, zero served to explain something that was absent in a particular calendar count, but later it got the numerical meaning used in calculations for more than 1000 years.

<sup>12</sup> *Calendar Round* was based on two overlapping annual cycles: *Divine calendar* or *tzolk'in* (260 days = 20×13 days) and a *Solar calendar* or *Haab* (365 days = 18×20

FIG. 7 CARACOL, CHICHEN ITZA, YUCATAN  
(CATHERWOOD DRAWING)  
SL. 7. CARACOL, CHICHEN ITZA, YUCATAN  
(CATHERWOODOV CRTEZ)



the northern Yucatan Peninsula – cities like Uxmal and Chichen Itza began to grow.

**Postclassic period (900-1539 AD)** – Changes from the preceding Classic Period marked this Period. The cities across the highlands and the Pacific coast were relocated or abandoned after a continuous inhabitation of almost 2,000 years<sup>13</sup>, apparently due to the warfare. New city locations were on hilltops, with a kind of “ditch-and-wall” defense system and/or near-by permanent drinking water resources – the urban activity shifted to the northern lowlands and highlands. Cities like Chichen Itza and others in Puuc region, after a sudden growth, faced a dramatic decline in the 11<sup>th</sup> century and thus gave a chance for the city of Mayapan to rise in the 12<sup>th</sup> century (abandoned in 1448). Other new towns were established by the Caribbean coast initiating new road and trade networks. Political, social, and environmental turbulences were the primary cause of the urban collapse of the Southern region. The city abandonments occurred along with a period of long wars, diseases, and natural disasters that hit the Yucatán Peninsula. After the arrival of Spaniards the coastal and inland cities were abandoned and conceded to the power of nature – the sites became ruins and covered by dirt and vegetation (Fig. 7). This process of natural decline continued for another three centuries until they were re-discovered.<sup>14</sup>

days and 1x5 days) that would meet on the same day every 52 years. The *Long Count* calendar was introduced in 236 BC starting on August 11, 3114 BC. Days within the *Long Count* calendar were grouped into five time-cycles named: *baktun* (144,000), *k'atun* (7,200), *tun* (360), *uinal* (20) and *kin* (1). One Grand Cycle was equal to 13 baktuns, or about 5,139 years.

<sup>13</sup> SHARER, TREXLER, 2006: 618

<sup>14</sup> In 1839, F. Catherwood and J. L. Stephens started a trip to the inland of Yucatan peninsula, where they found numerous structures abandoned for centuries. Stevens kept a diary, superbly illustrated by Catherwood's drawings *in-situ*. The results were published in 1841 (*Incidents of Travel in Central America, Chiapas and Yucatan*) and 1843 (*Incidents of Travel in Yucatan*).

<sup>15</sup> WILLEY, 1956: 112; SMITH, 2011: 53

<sup>16</sup> BULLARD, 1960: 358

<sup>17</sup> Today, Kabah site is divided by a regional road (destroying the long *sacbe* connecting it with Uxmal). The eastern part (the ruling family residential area) has been researched more. The most important building there is the *Codz Poop* (*Palace of the Masks*), built atop the large platform with a facade ornamented in *Puuc* style, having more than 250 *Chaac God* masks. The much larger *central* and *western group* are still forested.

<sup>18</sup> Labna site was a very compact one, an excellent example of towns in the Hilly Region of Yucatan. The notable building, a two-story *Palace* (more than 60 rooms, 120 m long), is the longest *Puuc style* building. The building is cut into a small hill, with the south facade facing the vast plaza and 3 meters wide and 200 meters long *sacbe* that runs towards a gateway arch and the pyramid-like structure with a roof-comb temple *Mirador*.

<sup>19</sup> Town of Sayil is spread along a north-south *sacbe*, having a three-story terraced building (*Great Palace*) on the north with a wide stairway. It has an 85-meter-long facade. South from the *Palace*, there are some remnants of structures: *Pyramid Temple* (*El Mirador*) and *South Palace* with a *Ballcourt*.

## MAYAN SETTLEMENT PATTERNS

### OBLCI MAJANSKIH NASELJA

Mayan society was sharply divided into several social groups: *nobles*, *commoners*, *serfs*, and slaves. The first one was for rulers, administration officials, military commanders, high priests, traders, and they lived in “urban” centers. The second group embraced farmers, workers, and servants who lived outside the center borders, close to their land. The serfs were people who farmed the land that belonged to the ruler or local town leaders. The last group covered the people who were, either punished for crimes or were the prisoners of war. Anyway, the population “distribution” was highly ordered, and the number of each social group would cause the settlement grouping and pattern.

Following Willey's and Smith's<sup>15</sup> research on the New World settlement pattern, the spatial configuration of Mayan settlements should be observed through the occurrence of spatial clustering of houses and space in-between in relation to centers that had the most important structures and buildings (pyramids with temples, palaces...). Accordingly, the Mayan settlements can be observed within three major groups:

**A** – houses built close to the center

**B** – houses widely dispersed around the center

**C** – few houses grouped around a building or a structure in small clusters, spread within a certain distance from the center.

But the American archeologist, W. Bullard<sup>16</sup>, suggested more contemporary and functional differentiation of the Mayan settlements setting them into two major groups: archeological remains (house ruins, minor ceremonial centers, and particular purpose features) and ruin groupings and settlement organization (clusters, zones, and districts). The first subdivision, in a larger scale, may be compared to Willey's group C. Which-ever division we consider as the most appropriate there is something in common for each of them: types of structures and buildings within and that distinguish a settlement from one to another.

There are thousands of Maya settlements spread across five previously mentioned today's countries. The six sites, with particularly outstanding architecture or plan-layout chosen to be presented in this paper are in Mexican states of Yucatan and Quintana Roo (Fig. 8), and visited and experienced by the author in 2018. In alphabetical order, they are as follows: **Tulum** in Quintana Roo, and **Chichen Itza**, **Dzibilchaltun**, **Ek Balam**, **Mayapan**, **Uxmal** with **Kabah**<sup>17</sup>, **Labna**<sup>18</sup>, and **Sayil**<sup>19</sup> in Yucatan (Figs. 9-11).

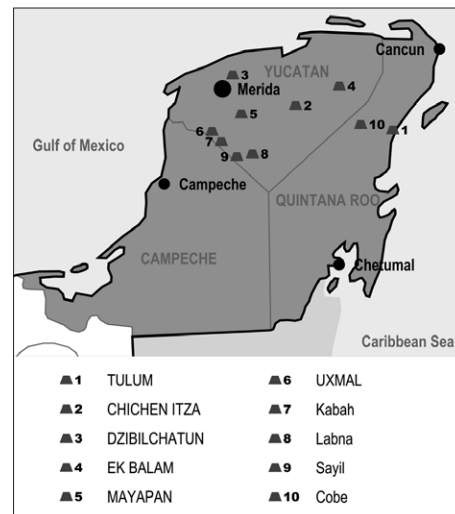


FIG. 8 POSITION OF THE OBSERVED MAYAN CITIES ON YUCATAN PENINSULA  
SL. 8. POLOŽAJ SPOMENUTIH MAJANSKIH GRADOVA NA POLUOTOKU YUCATAN

FIG. 9 PALACE OF THE MASKS, KABAH  
SL. 9. PALAČA MASKI, KABAH



FIG. 10 PALACE, LABNA  
SL. 10. PALAČA, LABNA

FIG. 11 GREAT PALACE, SAYIL  
SL. 11. VELIKA PALAČA, SAYIL





FIG. 12 COMPARISON OF THREE PYRAMIDES:  
UXMAL, CHICHEN ITZA, AND COBA

SL. 12. USPOREDNI PRIKAZ TRIJU PIRAMIDA:  
UXMAL, CHICHEN ITZA I COBA

## STRUCTURE TYPES WITHIN A MAYAN CITY

### VRSTE GRADEVINA UNUTAR MAJANSKOG GRADA

The Mayan architecture was far more diverse in its appearance and size than the architecture of Olmecs. The construction and shape are mostly in a tight connection with astronomical events. The most remarkable structures in Mayan architecture (Fig. 1) are **pyramids** (with a temple on the top), **palaces**, **ballcourts**, **observatories**, **sacbes**, **city-walls**, **E-groups**<sup>20</sup>, **triadic groups**, platforms. Most of these structures were of a near-to-rectangular shape (the *Pyramid of a Magician* in Uxmal, Observatories in Chichen Itza and Mayapan are the exception).

The **pyramids** are step pyramids (like ziggurats in Mesopotamia) and their construction commenced in the late Pre-Classic. Two types of pyramids were built: the ones used for religious and sacrificial rituals, while the others did not have any function except to be noticed as a strictly sacred (very steep) structure. The size ranged from just a few meters of height, up to the one like in Cholula (Fig. 13) that was more than 65 meters of height.<sup>21</sup> The pyramids for the sacrifice had stairways (two or four) providing the access for the priest to the top temple (closer to the God). The pyramids were taller than the jungle trees and

could have served as the orientation within space. In most cases, the pyramids were designed, built and positioned to serve specific astronomical issues – the point of the sunrise at the time of solstices and equinoxes. The most intriguing ones are the *Pyramid of the Magician* in Uxmal (with an elliptical floor plan), the *Pyramid of Kukulcan (El Castillo)* named by Spaniards) in Chichen Itza, and the *Pyramid of Nohoc Mul* in Coba, Quintana Roo (Fig. 12). Some of the pyramids housed the tomb of a ruler (like the sarcophagus of Pakal found inside the *Temple of Inscription*, atop a pyramid in Palenque, Chiapas state).

**Palaces** were large buildings, with highly ornamented facades (painted or with relief)

<sup>20</sup> Specific structure complex that is not frequent in Yucatan state (Dzibilchaltun and Kabah are the only ones found by the author), but in Guatemala and Belize. The structure consists of a north-south oriented elongated platform next to the plaza, with three smaller temple mounds, or two with a terraced pyramid in between. Some scholars think they were used for astronomical features (the sunrise and sunsets at certain days, and the delineation with other astronomical appearances). The platforms were made of limestone and elevated 3-4 meters, and used for public and religious ceremonies. Smaller structures like altars, *stelae*, or important society members tombs were found, too.

<sup>21</sup> A Cholula pyramid (Puebla) is the largest one worldwide: 450x450 m of floor plan and 65 m high. The pyramid had a temple of *Quetzalcoatl* (feathered snake) on the top and was built in four stages during 12 centuries (3<sup>rd</sup> BC – 9<sup>th</sup> AD). The pyramidal construction is well preserved, in spite of the Spanish brutal looting of Mayans' sites. As the whole site was deserted by the end of the 10<sup>th</sup> century AD, the pyramid was covered by dirt and vegetation and concealed under the mound that appeared to be a natural hill at the time (1594) the Spaniards built a church on the top to symbolize the imposition of Christianity in this part of Mexico. The pyramid structure was discovered in 1881, by A. Bandelier, the American archeologist.

<sup>22</sup> The doorways and freestanding Arches were oriented to catch the sunrise or sunset on a specific date. The stairway wall of the *Kukulcan pyramid* in Chichen Itza was used as a "screen" for projecting the shadow from the pyramid steps edge, which (along with the stone serpent head at the bottom of the stairway) produced an image of a serpent descending from the pyramid. The *Temple of Seven Dolls* in Dzibilchaltun with its central "door" served for the first glimpse of the rising sun on March 21<sup>st</sup> to spread along the *sacbe*.

<sup>23</sup> The concept of a *house* was very different than today. The huts were one-room buildings and were spread widely around the center, away from the public buildings and structures. Several *huts* with various functions (sleeping, storage, eating...) grouped "created" a house.

FIG. 13 CHOLULA PYRAMID, PUEBLA, PUEBLA

SL. 13. PIRAMIDA CHOLULA, PUEBLA, PUEBLA







FIG. 14 COMPARISON OF THE OBSERVATORIES:  
CHICHEN ITZA AND MAYAPAN  
SL. 14. USPOREDNI PRIKAZ ZVEJDARNICA:  
CHICHEN ITZA I MAYAPAN

and used to house the elite population. They had many chambers within up-to-three floors above the ground, and had one or more courtyards. These buildings were used as a burial place for palace residents. In front of the palaces, there are platforms – large squares for public gatherings. Some of the palaces, worth mentioning, are the ones in Uxmal (*Governor's palace*) and Sayil (a three-floor high building, nearly 85 meters long) that create a unique appearance at the site (Fig. 15).

The circular temples dedicated to the God Kukulcan (like the one in Chichen Itza and Mayapan) are often considered to be the **observatories** (Fig. 14), but there is no exact proof for that. As mentioned previously, many of the Mayan buildings and structures were built to record some astronomical features.<sup>22</sup> For this reason, the label "observatory" can be applied to any Mayan structure regardless of their primal function.

A **ballcourt** is an unavoidable part of the Mayan settlement. The ritual ball game was inherited from the Olmecs and played with a solid rubber ball (30 cm in diameter), on a play-field bordered firstly by sloping sides

(Coba) and later by vertical sides like the one in Chichen Itza (Fig. 16).

One of a structure that was of the great importance for Mayas is a **sacbe** (causeway), an elevated paved road bordered on both sides, with a function of enabling the Mayans to travel within and out of the cities.

The final structure, worth mentioning is a **city wall** that cannot be found at every site in Yucatan. The most significant ones are at Tulum (Quintana Roo), Ek Balam, and Mayapan (Yucatan).

Other characteristic Mayan settlement buildings were residential houses – **huts**<sup>23</sup>, built of wooden poles and thatch, plastered with mud, set atop a low-height mound-base and covered with hay that protected from sun and rain.

## CASE STUDIES

### PRIMJERI GRADOVA

Hereafter, a short description of the chosen sites in Yucatan and Quintana Roo is given, preceded by some general data for each of them.

FIG. 15 GOVERNOR PALACE, UXMAL  
SL. 15. GUVERNEROVA PALAČA, UXMAL

FIG. 16 BALLCOURT, CHICHEN ITZA  
SL. 16. IGRALISTE, CHICHEN ITZA



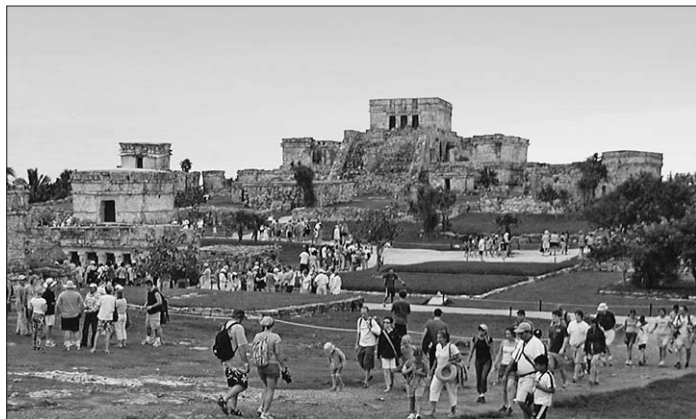


FIG. 17 TEMPLE OF DESCENDING GOD AND EL CASTILO, TULUM, QUINTANA ROO

SL. 17. HRAM SILAZEC EG BOGA I UTVRDA EL CASTILO, TULUM, QUINTANA ROO

FIG. 18 TEMPLE OF WARRIORS, CHICHEN ITZA

SL. 18. HRAM RATNIKA, CHICHEN ITZA



name:	<b>TULUM</b>
settlement type:	A
time of abidance:	1280-1590 AD
area coverage:	2,5 hectares within the wall + 12 hectares outside the wall
population:	1000

The town of Tulum (in the Mayan language it means "wall") was built on a 13 meters tall cliff near-by the Caribbean Sea. It is one of the last cities built before the Spaniards' arrival and was an important port through which the Mayans made most of their sea trade. The town had a rectangular shape that was conditioned by the walls (3-5 meters tall and up to 8 meters thick) along three sides<sup>24</sup>, while by its fourth side was next to the cliff. The main gate was within the west wall, while the other two walls had several secondary gates. On both corners towards the mainland, there were two watch-towers. The city had its peak between the 13<sup>th</sup> and 15<sup>th</sup> century and was still inhabited for some 70 years after the Spaniards commenced their conquer of the land. The most vivid structures in Tulum are *El Castillo*, the *Temple of Descending God* (Fig. 17) and the *Temple of the Frescoes*. The last-mentioned structure might have served as the observatory, too. Other, worth noting, structures are *House of the Columns* and *House of the Chultun*.

name:	<b>CHICHEN ITZA</b>
settlement type:	C
time of abidance:	450-1480 AD
area coverage:	1000 hectares
population:	50,000

The area of Chichen Itza ("Mouth of the Itza Well" in the Mayan language) has been occupied ever since the first millennium BC, but as the Mayan settlement it was mentioned in the 8<sup>th</sup> century when the first structures were built between two cenotes (natural sinkholes with drinking water). Around 600 AD it be-

came a ruling (political, economic and religious) center for the northern Yucatan. The most dominant structures were built between 625-800 AD, but between 800-900 the settlement was abandoned and used for religious rites, only. The next revival occurred in the mid of 10<sup>th</sup> century when the Itza people returned to the site. By the end of 10<sup>th</sup> century, the Toltec king and his army came to Chichen Itza. That was the beginning of the Toltec influence over the site (construction of vast colonnades and other structures with carvings of serpents and deities). The shape of the city was irregular, hard to define. The beginning of a decline is dated by a transition between the 12<sup>th</sup> and 13<sup>th</sup> century when no major structures were built. The most important structure of Chichen Itza is the nine-step *Pyramid of Kukulkan* built between 11<sup>th</sup> and 13<sup>th</sup> century for the *Feathered Serpent God*, named by the Spaniards *El Castillo* because of its size and appearance. The pyramid was upgraded in several phases, reaching the height of 30 m and the floor size of 55x55 m. It has stairways on 4 sides with 91 steps, each. When the step in front of the temple built atop is added, a number of 365 is reached – the number of days in a year. The orientation and design have astronomical issues (solstice and equinox). Next structure worth mentioning is a circular building – observatory *El Caracol* (snail in Spanish because of the spiral stairway inside of it) some 14 m of height, built over a platform. It was rebuilt several times to calibrate its astronomical observation of the Pleiades, the Sun, Venus movements). The site contains many other structures like *Ballcourts*, *Temple of the Warriors* (Fig. 18), *Court of the Thousand Columns*, *Temple of the Big Tables*, *Temple of the Wall Panels*, *Nunnery*, *Osario* and numerous platforms of different sizes. The site is crisscrossed by more than 30 *sacbes*, out of which the one connecting the site with the



*Sacred cenote* is the best preserved. Today, Chichen Itza, along with Uxmal, is on the UNESCO WHL.

name:	<b>DZIBILCHALTUN</b>
settlement type:	B
time of abidance:	500 BC - 1,500 AD
area coverage:	150-1900 hectares
population:	25,000-40,000

Dzibilchaltun ("writing on flat stones" in the Mayan language) was one of the largest Mayan cities, close to the northeast shore of Yucatan, still populated at the time of the Spanish arrival. During the excavations, the archeologists have discovered over 8,000 structures, out of which the most outstanding one is the *Temple of the Dolls* (Fig. 19). It was built on a terraced platform, with three small buildings west of it, and a blank *Stela 12* which might have been used for astronomical viewing along with the openings of the *Temple of the Dolls* (autumn and spring equinox sunrise). The temple was connected with Central Plaza (105×135 m) with a 650 m long *sacbe 1*. On the north side of the plaza, there is a 10 m high four-tiered small pyramid (structure 36) with a central stairway, while along the south edge a plaza there is nearly 130 m long building (structure 44) with numerous chambers and doors facing the plaza and a continuous stairway, 5 m high. Within the plaza there are ruins of a chapel built by the Spaniards. There are some more buildings and ruins near-by that have not been reconstructed yet. The area south of *sacbe 1* is filled up with numerous irregular residential stone houses.

name:	<b>EK BALAM</b>
settlement type:	B
time of abidance:	100 BC - 900 AD
area coverage:	100-1,200 hectares
population:	unknown

The town of Ek Balam ("black jaguar" in the Mayan language) was "discovered" in the

late 1980s, but the first comprehensive research was performed in the 1990s. Ever since, 45 structures have been discovered and mapped. The smaller area (some 100 hectares) is surrounded by a double defense wall (3 m wide and 1.5 m high), with entrances through which a *Central Plaza* can be reached by a *sacbe* (set in cardinal direction). Inside the walls, on the north side, there is the major building – *Acropolis* that has a temple (called *El Trono* – the Trone) in which the ruler (Ukit Kan Lek Tok) was buried. The size of the *Acropolis* is 162 by 68 meters in floor plan and 32 m in height. Its south facade is a highly decorated – not in a carved stone but in stucco and limestone mortar that could be easily modeled, and then painted. Along the east and west side of the *Central Plaza*, there are large platforms II and III (more than 120 m long, and 20 m high), and a small ballcourt on a south edge. By the south edge of the *South Plaza*, there is a structure – the *Oval Palace* (Fig. 20), which orientation seems to be connected with some astronomical features. On the west edge of a plaza there, a *structure XVII* or *The Twins* having two mirroring temples on each side, while on the east side there is a *structure X*. *Structure XVIII* is a small entrance Arch that was probably used for ceremonial purposes. Outside the walls, in the forest, there are many smaller structures/ruins waiting to be cleared.

name:	<b>MAYAPAN</b>
settlement type:	A
time of abidance:	1,000-1450 AD
area coverage:	420 hectares
population:	10-12,000 + 5,000

Mayapan city was a part of a triple alliance with cities of Chichen Itza and Uxmal, but it managed to exist in later days than the other two cities. Mayapan architecture is a mixture of Mayan and Toltec architectural elements. The main square is bordered by governmen-

FIG. 19 TEMPLE OF DOLLS, DZIBILCHALTUN  
SL. 19. HRAM LUTAKA, DZIBILCHALTUN

FIG. 20 SOUTH PLAZA COMPLEX WITH OVAL PALACE,  
EK BALAM  
SL. 20. SKLOP JUZNOG TRGA S OVALNOM PALAČOM,  
EK BALAM

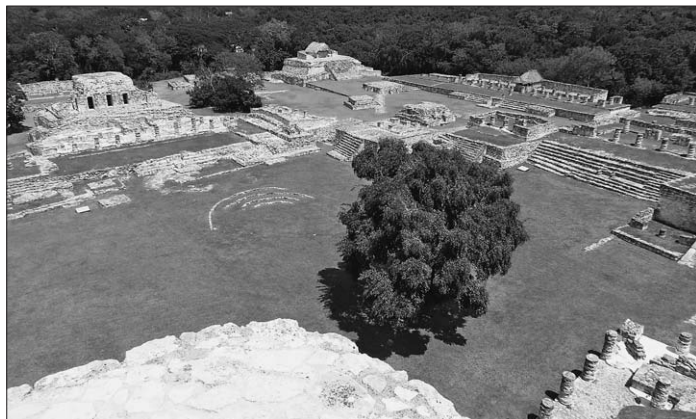


FIG. 21 CENTRAL STRUCTURES OF MAYAPAN  
SL. 21. SREDIŠNJE GRAĐEVINE MAYAPANA



FIG. 22 NUNS' QUADRANGLE AND THE PYRAMID  
OF A MAGICIAN, UXMAL  
SL. 22. SAMOSTANSKI SKLOP I PIRAMIDA ČAROBNJAKA,  
UXMAL

tal, religious and ruling class buildings. The whole area within the city walls (with 12 entrances, out of which 7 had vaulted gates) is bursting with structures and buildings (Fig. 21): temples, altars, platforms (there are more than 4000 structures). The inner-walls area is dominated by a 9-tiered pyramid, which reminds very much on the pyramid in Chichen Itza (not only by the same name). Many buildings within the city-walls have collapsed vaulted roofs (what is not the case in Chichen Itza and Uxmal). Besides, there are three circular buildings that might be used as observatories (compared to just one in Chichen Itza and none in Uxmal), and only structure that is missing, compared to Chichen Itza and Uxmal, is a ballcourt. The Mayas abandoned the Mayapan around 1448, after a period of political, social and environmental turbulence.

name:	<b>UXMAL</b>
settlement type:	C
time of abidance:	500-1,200 AD
area coverage:	60-140 hectares
population:	25,000

Uxmal ("thrice built" in the Mayan language) is one of the most attractive archeological sites connected with Mayan culture. Main structures cover the area of approximately 60 hectares where some 25 structures and buildings are worthwhile seeing. The main

structure is a 35 m tall stepped pyramid (*Pyramid of a Magician*) built over an oval-shaped floor-plan (instead of more accepted rectangular one) between 600 and 950 AD. The final version of a pyramid is a result of the construction of five pyramids, each larger and built over the one beneath. On the rear (east) side there is a wide stone staircase leading to the summit where a temple was built. The opposite side is fully decorated (*Chaac God* masks, latticework panels, and stone mosaics), with some additional structures (temples) by the bottom of the pyramid. In the vicinity, there is a *House of the birds* (named after the birds decoration found at the friezes) and a group of four elongated buildings around 80 by 65 m patio – the *Nun's Quadrangle* (Fig. 22). The name was given by Spaniards, probably because of 74 rooms that are within this complex (reminding of the nuns' chambers). Both building facades are elaborately carved and decorated.

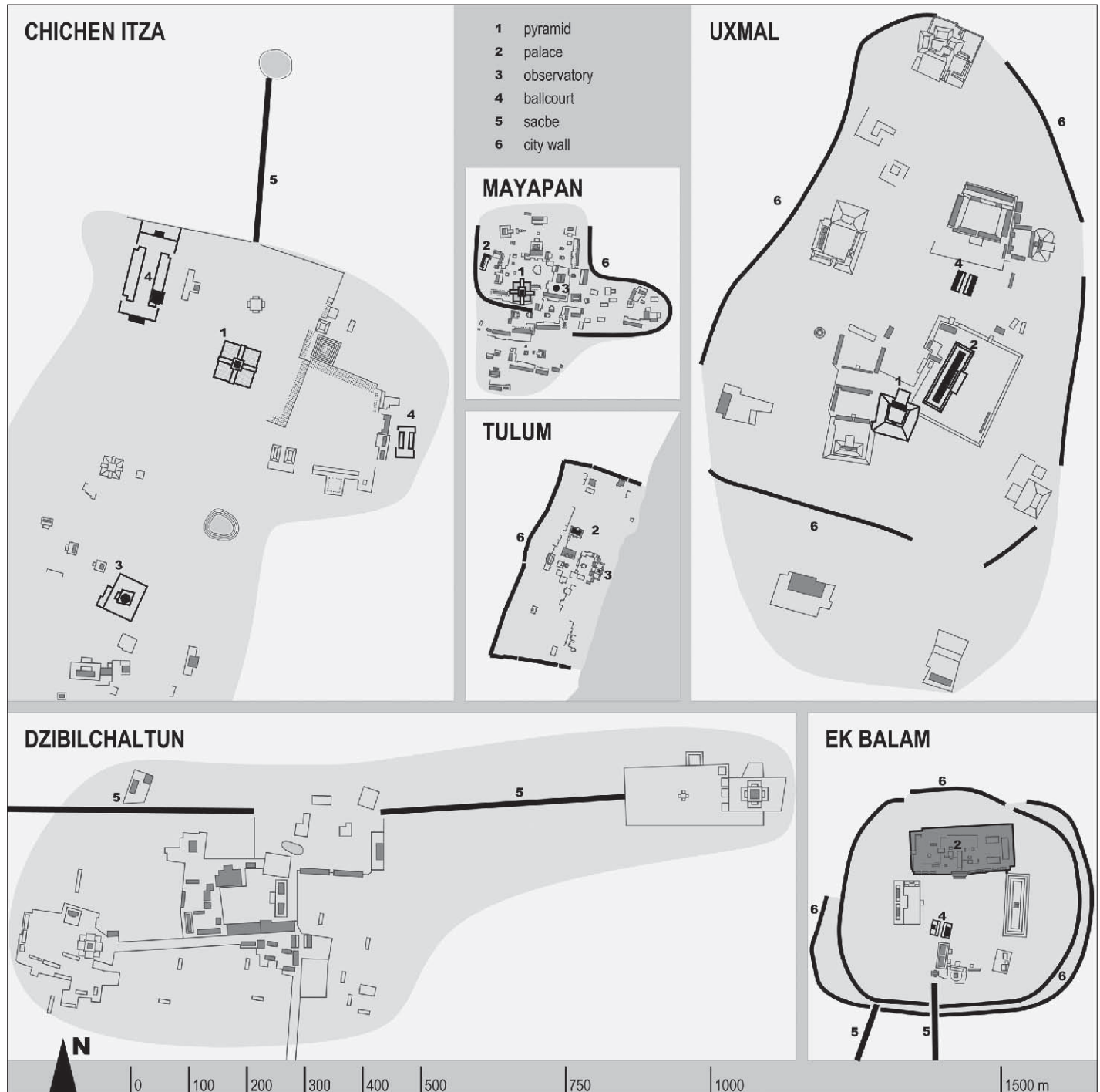
There are some more buildings southward like the *Governor's Palace*, *Ballcourt*, *House of the Turtles*, *Dovecote group*, *Pyramid of the Old Woman* and the *Great Pyramid* (nearly 80 m of a base size). Among the structures west of the *Nun's Quadrangle* and the *Governor's Palace* stands, so-called a *Cemetery group* (the elongated temple standing on a low base platform and a ruined pyramid west of it).

The *Governor's Palace* is one of the best examples of the Puuc style<sup>25</sup>: three-parts building stands atop a 9 m high terrace, with stairways along the whole facade. It has a 90 m long mosaic having more 100 *Chaac God* masks. In front of the *Palace*, there is a *Plaza* with a two-headed jaguar throne. The city of Uxmal was closely connected with three smaller towns: Kabah, Labna, and Sayil.

TABLE 1 CHARACTERISTIC STRUCTURES OF MAYAN CITIES FROM CASE STUDIES  
TABL. 1. KARAKTERISTIČNE GRAĐEVINE OBRADENIH MAJANSKIH GRADOVA

CITY	SETTLEMENT TYPE	CHARACTERISTIC STRUCTURES					
		pyramid	palace	observatory	ballcourt	sacbe	city-wall
Tulum	A	–	+	+	–	–	+
Chichen Itza	C	+	–	+	+	+	–
Dzibilchaltun	B	–	?	–	–	+	–
Ek Balam	B	–	+	–	+	+	+
Mayapan	A	+	+	+	–	–	+
Uxmal	C	+	+	–	+	+	+

25 PROSKUORIAKOFF, 1963: 76



## CONCLUSION

### ZAKLJUČAK

The history of making cities in pre-Hispanic World is a very long one – over 3,000 years. After the Olmecs and Zapotecs, the Mayan civilization expressed their knowledge, not only through their tangible heritage (colossal

buildings and structures) but also through the intangible heritage (mathematics, writing-system, time-recording) that prove they were a civilization rather than just groups of aboriginals. Through three significant periods (Pre-classic, Classic, and Post-classic), starting with huts and small camps they created great towns and cities. Their settlements

FIG. 23 COMPARATIVE PRESENTATION OF THE SIZE AND THE LAYOUT OF THE OBSERVED CITIES

SL. 23. USPOREDNI PRIKAZ VELIČINE I TLOCRTA PROMATRANIH GRADOVA

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were never laid out on a grid, but rather in an unplanned way, although most of the buildings or structures were built (oriented) following some astronomical issues (solstice, equinox, or towards some visible stars or constellations). That's why it is complicated to define the city size and its pattern.<sup>26</sup> Examples of the Mayan city layout (Fig. 23) with the mark-down of the characteristic structures (Table I) presented in this paper prove that. The central settlement core was a home for ritual, administrative and other elite residential buildings or structures (pyramids, temples, palaces, observatories, ballcourts, markets, elevated platforms), but not that every city had it. The buildings were gathered around plazas used for ceremonial and public gatherings. Some of the cities had city-walls. The residential area needs were fulfilled by constructing houses – "huts" inside the rainforest or over the clear-cut rainforest land. Residential areas for the *nobles* occupied the best land around the city center, while *commoners* had their residences grouped in the second "belt" from the city core (sometimes around several larger structures). The living places for *serfs* were within a scattered second belt – dispersed further away from the ceremonial center. This created three significant types of Mayan settlements (**A**, **B**, and **C**), making it difficult to estimate the city population, but some of the cities had reached numbers that were much larger than the ones of the European cities at the same time.

[Written in English by the authors]

<sup>26</sup> Observation was performed on fieldtrips in November 2016 and October 2018, during scholar visits to Universidad Juárez Autónoma de Tabasco – UJAT, Villahermosa, Tabasco, and Anahuac-Mayab University – AMU, Merida, Yucatan, Mexico.

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### ILLUSTRATION SOURCES

#### IZVORI ILUSTRACIJA

- FIG. 1, 3, 9-22 Photo: Lipovac, N.  
 FIG. 2, 6, 8, 23 Sketch: authors  
 FIG. 4 <https://peopleofonefire.com/something-else-is-really-bothering-me-about-the-track-rock-petroglyphs.html/comment-page-1> (12.11.2018.)  
 FIG. 5 Descriptive photo: authors  
 FIG. 7 BOURBON, 1999: 184

## SAŽETAK

## SUMMARY

## MAJANSKI GRADOVI YUCATANA

## OBLICI NASELJA I VRSTE GRAĐEVINA

U ovome radu predstavljani su početni rezultati istraživanja prapovijesnih naselja Srednje Amerike, odnosno Meksika, ovaj put s naglaskom na područje poluotoka Yucatan. Istraživanje je provedeno tijekom znanstvenih gostovanja na *Universidad Juárez Autónoma de Tabasco*, Villahermosa, Tabasco (2016.) i *Anahuac-Mayab University*, Merida, Yucatan (2018.). Područje Srednje Amerike (*Mesoamerica*) bilo je naseljeno još prije 22.000 godina, a prvom pravom civilizacijom smatraju se Olmeki koji su bili preteče Maja. Tri su najvažnija olmečka naselja: *San Lorenzo*, *La Venta* i *Tres Zapotes*. *San Lorenzo* (1500.-900. pr.n.e.) sastojao se od nekoliko manjih zaselaka na brdima pod upravom istoimenoga urbanog centra. *La Venta* (1200.-400. pr.n.e.) bila je civilno i vjersko središte te se smatra prvim 'planiranim' gradom prije dolaska Španjolaca. Druga važna kultura prije Maja bili su Zapoteki. Njihov glavni grad *Monte Alban* (500. pr.n.e. – 800. n.e.) sagrađen je na umjetnoj visoravni i namijenjen za stanovanje 'više klase', dok su ostali stanovnici živjeli u dolini. Za razliku od jakih središnjih naselja Olmeka, Maje su organizirane u više 'kraljevstava' rasirenih na području današnjega istočnog Meksika, Belizea, Gvatemale, Salvadora i zapadnog Hondurasa, na površini većoj od 350.000 km<sup>2</sup> podijeljenoj na tri zemljopisne cjeline: sjeverno, središnje i južno područje. Maje su na tom prostoru živjele više od 3000 godina. Ovo razdoblje službeno se promatra kao *pretklasično* (1800. pr.n.e. – 250. n.e.), *klasično* (250.-900.), *postklasično* (900.-1539.). Pretklasično razdoblje počinje u trenutku kada nomadska plemena započinju s uzgojem različitih kultura i grade prva stalna naselja. S vremenom neka od tih naselja postaju urbana i vjerska središta kojih graditeljstvo ima mnogo zajedničkog s Olmekima. Primjer je *El Mirador* (200. pr.n.e. i 150. n.e.), grad u Gvatemali, koji je brojio gotovo 100.000 stanovnika i bio vrlo dobro prometno povezan s ostalim gradovima. Klasično razdoblje predstavlja vrhunac majanske civilizacije, a obilježava ga gradnja velikih građevina i gradova koji su brojili između 50.000 i 120.000 stanovnika. Sve građevine građene su ručno, bez

pomoci kotača. Posebno je razvijeno poznavanje astronomije i jedinstveno slikovno pismo kojim su pisali po kamenu, keramici ili posebnom papiru. Maje su koristili *vigezimalni* brojni sustav (s brojem 20 kao osnovicom), uz korištenje samo dva brojana znaka – točka (1) i crtica (5), a poslije je uveden znak za ništa – nula. Vrijeme su mjerili s pomoću dva *godišnja* kalendara i jednoga za *dugo brojenje*. Na prijelazu u *postklasično razdoblje* bilo je mnogo ratova koji su uzrokovali napuštanja starih naselja, dok se nova naselja grade na brdima ili u nizinama *sjevernog područja* uz izgradnju obrambenih zidova i jaraka.

Majansko društvo bilo je zasnovano na strogim klasnim podjelama na plemstvo, pučane, sluge i robove, koje se očituju i u razmjestaju građevina unutar gradova. Prema istraživanju R.G. Willeyja mogu se odčitati tri glavna oblika naselja (A, B i C). Oblik A predstavlja naselje sa stambenim zgradama grupiranim oko jednoga središta, kod oblika B one su široko raspršene oko središta, dok su kod oblika C stambene zgrade izvan urbanoga središta raspršene i okupljene oko manjih javnih građevina. Pojedinačne građevine (piramide, palate, sportska igrališta, zvjezdarnice, E-grupe, *trojke* uzdignuti trgovi, ceste i obrambeni zidovi) čine okosnicu majanskoga grada. Njihova izgradnja i oblikovanje vrlo su često povezani s određenim astronomskim pojavama. Piramide, stepenaste građevine, korištene su za vjerske obrede (s hramom i prostorom za žrtvovanje na vrhu) ili samo kao prostorna obilježja. Visina im se kretala od svega nekoliko metara pa sve do više od 60 m (piramida u Cholululi). Piramide koje su se koristile prilikom žrtvovanja imale su 2-4 stubišta duž bočnih strana sve do hrama na vrhu. Palace su velike i bogato ukrašene zgrade namijenjene plemstvu s velikim brojem prostorija, visine do tri kata i s jednim ili nekoliko dvorišta. Ispred njih nalazili su se uzdignuti trgovi za javna okupljanja. Kružne građevine (posvećene božanstvu *Kukulcan*) smatraju se i zvjezdarnicama. Ali, kako je većina velikih majanskih građevina građena prema određenim astronomskim pojavama, taj naziv mogu imati i mnoge od njih. Igralište je bio

neizbježan dio majanskoga grada i služio je za obrednu igru loptom na površini bočno obrubljenoj, u početku kosim, a zatim okomitim zidovima. *Sacbe* predstavlja popločenu, izdignutu i obrubljenu cestu koja je povezivala građevine unutar gradova i gradove s vjerskim središtima ili međusobno. Spomenute građevine promatrane su i u prostornom i oblikovnom poimanju na primjeru 6 gradova Yucataka koje je autor osobno obišao i istražio.

Grad Tulum izgrađen je na litici iznad Karipskoga mora, pravokutnog je oblika zahvaljujući debelim gradskim zidinama na trima stranama prema kopnu i smatra se jednim od posljednjih gradova izgrađenih prije dolaska Španjolaca. Chichen Itza, najpoznatiji majanski grad na Yucatanu, sagrađen je između dvaju prirodnih jezera s pitkom vodom (*cenota*) i neodređenog je oblika, unutar kojeg se nalaze gotovo sve spomenute građevine. Više je puta bio napušten i ponovno naseljen. Dzibilchaltun, grad na sjeveru Yucataka, bio je naseljen čak i u doba dolaska Španjolaca. U sirem području imao je više od 8000 građevina. Ek Balam je 'otkriven' tek krajem 20. stoljeća. Središte s akropolom, obrubljeno dvostrukim zidinama, dobro je istraženo i obnovljeno, dok se prostor i građevine izvan zidina još uvijek istražuju. Mayapan je bio dio trojnoga saveza gradova (zajedno s Uxmalom i Chichen Itzom) i najduže je 'preživio'. Za razliku od ovih dvaju gradova, građevine unutar gradskih zidova Mayapana (njih oko 4000) gusto su izgrađene oko središta. Uxmal je jedno od najprivlačnijih arheoloških nalazišta majanske kulture. *Carobnjakova piramida* (ovalnoga tlorisnog oblika i glatkih strana), kao i samostanski sklop, samo su neke od posebnosti ovoga grada.

Na kraju ove etape istraživanja nastanka majanskoga grada može se zaključiti da pojedini grad nije imao neku određenu tlorisnu matricu – njegov oblik i rubove vrlo je teško odrediti. Ali zato su smjer, oblik i položaj pojedinih građevina pomno isplanirani u odnosu na astronomске pojave. Spomenute građevine nisu se pojavljivale u svakome od majanskih gradova.

## BIOGRAPHIES

## BIOGRAFIJE

Prof. **NENAD LIPOVAC**, Ph.D., commenced scholar research on *History of Making Americas Prehistoric Settlements*, during the Fulbright grant (2002) at CED UC at Berkeley. The derived results, always connected with his personal experience of the sites, have been published and presented worldwide.

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