
CONVERSATIONS, CONTROVERSY, AND CALCULATIONS IN NA UNPUBLISHED CHILAM BALAM OF YUCATANⁱ

CONVERSAÇÕES, CONTROVÉRSIAS E CÁLCULOS EM UM CHILAM BALAM DE
YUCATAN INÉDITO

CONVERSACIONES, CONTROVERSIAS, Y CALCULACIONES EN UN CHILAM
BALAM INÉDITO DE YUCATÁN

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ABSTRACT

In this article I explore the benefits and dangers of intercultural contact in the context of the creation and diffusion of Chilam Balam books, sacred texts compiled mainly during the colonial period and used by Maya communities of Yucatan. I present the results of my fieldwork to the area which include the narrative of the disappearance and re-creation of an unpublished Chilam Balam as well as a partial reproduction of its contents including a chapter on *Maya Numbers* and a collection of Maya hieroglyphs. This reproduction of an original unpublished Chilam Balam manuscript is a unique contribution to the field of Maya studies and evidence of the Maya episteme regarding numbers, time, and the universe.

KEYWORDS: Chilam Balam. Colonial period. Maya mathematics. Maya literature. Mathematics education. *Tsikbal*.

RESUMO

Neste artigo, eu exploro os benefícios e os perigos do contato intercultural no contexto da criação e da difusão dos livros Chilam Balam, que são textos sagrados que foram compilados, principalmente, durante o período colonial e utilizados por comunidades maias de Yucatan. Apresento os resultados de meu trabalho de campo nessa área que inclui a narrativa do desaparecimento e da re-criação de um Chilam Balam inédito, bem como uma reprodução parcial de seu conteúdo, incluindo um capítulo sobre os *Números Maias* e uma coleção de hieróglifos maias. Essa reprodução do manuscrito original inédito de Chilam Balam é uma contribuição única para o campo dos estudos maias e evidencia a episteme maia com relação aos números, ao tempo e ao universo.

PALAVRAS-CHAVE: Chilam Balam. Período colonial. Matemática Maia. Literatura Maia. Educação matemática. *Tsikbal*.

RESUMEN

En este artículo se exploran los beneficios y peligros del contacto intercultural en el contexto de la creación y la difusión de los libros del Chilam Balam, textos sagrados compilados principalmente durante el período colonial y utilizados por las comunidades mayas de Yucatán. Se presentan los resultados de mi trabajo de campo a la zona, que incluyen la narración de la desaparición y la re-creación de un Chilam Balam inédito, así como la reproducción parcial de su contenido incluyendo el capítulo de *Números Mayas* y una colección de los jeroglíficos mayas. Esta reproducción de un manuscrito inédito original del Chilam Balam es una contribución

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Received on: 25/02/2017 – Accepted on: 31/05/2017

única para el campo de los estudios mayas y evidencia de la episteme maya en cuanto a los números, el tiempo y el universo.

PALABRAS CLAVE: Chilam Balam. Período colonial. Matemática Maya. Literatura Maya. Educación matemática. *Tsikbal*.

INTRODUCTION

The Chilam Balams are sacred texts of the Maya, dating back to colonial times, which ultimately came into existence as a form of preserving Maya tradition and are believed to be some of the most important sources of pre-Columbian literature, culture, and knowledge. Because of their direct connection to Maya heritage and immense historical value, they have been sources highly sought out by scholars and relics highly esteemed by local Maya communities.

In order to illustrate both the devastating and constructive potential of establishing relationships across disciplines, communities, and sources, I will present the tumultuous past of an unpublished Chilam Balam of Yucatan which is thought to be stolen by an anthropologist, re-compiled by community elders with the assistance of outside anthropologists, hidden from outsiders, and now copied and shared with trusted visitors to the community which I partially reproduce (in the appendix of this article) and discuss below.

The transcription and translation of this unpublished Chilam Balam provides us with a rare opportunity to examine a 20th century compilation of Maya sacred texts which postulates a unique perspective of Maya mathematics and its very story highlights the dangers and benefits of crossing the disciplinary divides and establishing multifaceted relations between people and their ways of knowing.

In the case of the unpublished Chilam Balam presented below, I have decided not to disclose the name of the specific Maya community it belongs to (nor the specific title of this sacred text), in the hopes that only those who are otherwise connected to the community and engaged in genuine *tsikbal* (Yucatec Maya term for conversation/exchange) with its members will have access.

As in the case of the disappearance of this particular text, many times the very preservation of these texts depends on the secrecy of their existence; in the context of the colonial period when indigenous texts could be looked upon with disdain as objects of

idolatry “the conservation of these documents, quite numerous in the Maya area, is due to the fact they were hidden in clandestine locations” (GONZALBO AIZPURU, 2011, p. 5).

The denomination *unpublished* used in reference to this text, reemphasizes the notion that it is an original manuscript that has never been massively reproduced or disseminated (the original manuscript as well as the 3 (three) copies of it that have been produced are still in possession of the community). In addition, like most field experience, the information presented herein is the product of *tsikbal* and as such a collaborative effort.

While I am deeply indebted to local informants and translators who so generously took the time to share their knowledge with me, I have decided to refrain from mentioning specific names and details in order to maintain some level of anonymity, as this community’s past experience shows that not all sharing of information leads to welcomed outcomes. I do recognize that Maya scholars will be able to identify the provenance of this text, but hope that the discussion and contents presented about this specific text will serve more as a general anecdote as opposed to a contextualized case study.

METHODOLOGY AND THEORETICAL FRAMEWORK

This research is the product of conversations and connections, on both a practical and theoretical level. Inspiration for this project developed while participating in the Yucatec Maya Summer Institute through the University of North Carolina, an intensive Maya language-learning program that forced participants to grapple with the multiple meanings associated to words (by constantly translating and code-switching between Maya, English, and Spanish), debate the diverse methodological approaches of knowledge production (by working with colleagues from all different disciplines including archeology, linguistics, and literature), and encounter the diverse ways of interpreting the world (by exploring Maya cosmology in the classroom and comparing these world views with our own).

I then carried out fieldwork the following summer in local communities of Yucatan, Mexico. My methodology was informed by an ethnographical approach in which I participated in community activities, established relationships with community members, identified local informants, and engaged them in conversation; I then used my field notes to reconstruct the story of the disappearance and recreation of the unpublished Chilam Balam and worked with native Yucatec Maya speakers and linguists to translate the text to English, but all images are my own. Theoretically, both my research approach and findings in regards to this unpublished Chilam Balam are connected to polysemic-related concepts as explored in interdisciplinarity, ethnomathematics, and Maya thought.

The ethnomathematics program has gained visibility, relevance, and strength in conjunction with the recent trend in academia to value and promote interdisciplinarity. While disciplines are oftentimes grounded in ageless canons, methodologies, norms, and discourses, the intersections between these traditions is an intellectual borderland where new ideas can blossom and grow. In this way, because of its nascent as well as hybrid characteristics, interdisciplinarity is by nature more inclusive and less normative. As a result of efforts to fund and support these interdisciplinary innovations and initiative, ethnomathematics, as well as many other cultural studies sub-disciplines or concentrations, have sprouted up at universities across the globe.

In addition to the newly-founded connections being made between disciplines, ethnomathematics in turn establishes new relationships between fields of study and their possible objects/subjects of study. Whereas anthropologists could be considered limited to the observation of live communities, mathematicians to the calculation of numbers and formulas, and literary scholars to the discourse analysis of inanimate text, interdisciplinary research allows for the academic freedom to consider all these sources from an infinite number of theoretical approaches. Such potential, however, also raises the need to establish relationships between fields and objects/subjects of study that combat colonial power relations in order to be inclusive of these diverse ways of thinking as opposed to threatening of their very existence.

In this way, my research on the numeric contents of a Maya text can be situated in the context of the ethnomathematics conversations that challenge traditional notions of mathematics as well as the historical narrative of Western mathematics. In his book *The Language of Mathematics: Telling Mathematical Tales*, Bill Barton (2008) illustrates how social influences, Language, and mathematical systematization developed together. Using this premise, it is also possible to argue that the emphasis placed on Western mathematics (as *the* universal mathematics) is an episteme that correspondingly privileges Western languages and social structures. This preference has led to an *Eurocentric* narrative of the History of Mathematics which ethnomathematicians and scholars are challenging through the discussion and promotion of non-Western ways of doing mathematics (ASCHER, 2002) and alternate histories of mathematics (JOSEPH, 2011). My research contributes to this effort by exploring the Yucatec Maya language, social structures, and mathematics, as expressed in a non-Western text whose historical trajectory, while coming in contact with the Western world, is distinct and independent.

While working with the Maya cultural production of the Chilam Balam, the notion of polysemy was not simply implicit in multiple meanings of terms and concepts explored in an

interdisciplinary and ethnomathematical approach, but very much explicit in the Maya thought and precepts that guided my investigation. During my courses in Yucatec Maya language, we were actually introduced to the term *polysemic* as defined as a *word that has many meanings*; this notion of multiple meanings was necessary to introduce as it is foundational to the Maya concept of identity (*máaxen* or who I am). This Maya notion of identity is composed of multiple layers, from lesser to greater importance, including *in k'aaba* (my name), *in kaajal* (my hometown/origin), *in láak'tsilo'ob* (my family/relatives). Identity is also connected to the process of naming, in which case, the Yucatec Maya have multiple forms of naming a person, related to those multiple meanings and connotations of a person's identity.

For example, a single person could be known by multiple names by multiple people, which generally stem from the following distinctions between types of names: *jach k'aaba'* (very name, or the name given at baptism), *pat k'aaba'* (nickname), *báaxal k'aaba'* (play name, or the name that highlights a certain characteristic prevalent in that person or even the antonym of that characteristic), *ko'oko' k'aaba'* (prank name), and the ritual name (which remains unknown to all except the *jmeen* or Maya ritualist/healer). Ultimately, polysemy operates at the base of Maya knowledge production as manifest in the words exchanged during *tsikbal* (conversation). In this exchange of words and names (of multiple meanings, uses, and perspectives) one establishes his place, his identity, and a respect (*tsiik* = respect, honor, or reverence) for one another and the world around him.

The polysemic nature of words and names was then expanded by our Yucatec Maya instructors to explain the polysemic nature of literature (as the intersection of language, culture, and thought); my exploration of Maya literature (as a genre inclusive of other disciplinary and mathematical knowledge) will consider the multiple meanings surrounding this text's production and promulgation. Ultimately, this unpublished Chilam Balam and its historical trajectory is the product of numerous exchanges between pre-Colombian Maya, Spanish colonizers, colonial scribes, European print sources, fields of knowledge, 19th and 20th century scholars, American collectors, and modern Maya communities, in which each level of translation and encounter contains multiple layers of meaning. My research focuses on these exchanges of information, culture, and history and considers them as opportunities to either contribute to or detract from the creation of a more inclusive portrayal of ways of knowing, which recognizes a plurality of perspectives.

The Sacred Books of the Chilam Balam

While the *Popul Vuh* written by K'iche' Maya of the Guatemalan highlands is oftentimes considered *the* sacred book of the Maya, there are many texts considered sacred

across different Maya communities. In the case of the Yucatan Peninsula, these texts dedicated to the preservation of Maya tradition are known as the Chilam Balam. The most disseminated books of the Chilam Balam are those which have been reproduced and circulated among scholars, Maya enthusiasts, and a larger audience; Laura Caso Barrera (2011) identifies the most well-known as those of Chumayel, Tizimín, Kaua, Ixil, Tekax, Nah, and Tusik as well as parts of the Chilam Balam of Maní as included in the recompilation of various Maya texts known as the Pérez Codex. Although these might be considered the most widely disseminated (at the moment), it is likely that each Maya community had (or has) their own collection of sacred texts (CRABINE; REINDORP, 1979). It is also likely that locals are aware of the existence of many more copies than those circulating as reproductions; a local informant told me that there are actually 18 known versions of the Chilam Balam.

While other important Maya texts have been identified in Yucatan as sacred books, the books of the Chilam Balam are designated as such because of their prophetic nature. In Yucatec Maya *chi'lam* refers to the one that has the word, the skill/power of the word, or the spokesperson, and *balam* means jaguar, so that Chilam Balam literally means the jaguar prophet, although *balam* can also be used as a human name (RIVERA DORADO, 1986). In terms of this unpublished Chilam Balam, reference is made to *Chilam Balam profeta* and his prophecies on page four, explicitly connecting this manuscript to the Chilam Balam tradition. On a practical level, this Chilam Balam also dictates, predicts, and informs daily life and social organization by commenting on the important dates of the calendar including the precise moments to plant corn, beans, and other crops, the sicknesses and ailments that would affect the population (as well as their resolutions), and questions of life and death.

For example, during the time I was in contact with the community, they were participating in prayer rituals known as the *ch'a' cháak* ceremony to invoke the Maya rain god (*cháak*) to send water to their fields. This is considered a moment of tension for the community as the women refrain from making handicrafts or other such chores so that all energy can be focused on this petition. I was informed that moments like these are contained within and predicted by this text. Initial explorations of this text have led me to classify this unpublished sacred text as part of the Chilam Balam collection (as do local informants who refer to it as a Chilam Balam)², but further study of the manuscript is necessary to determine the intricacies/sources of its contents and proximity to the criteria

²The text does make specific reference to the Chilam Balam prophet, predict daily occurrences, and was used in ways similar to the sacred books of other communities, but its unique and contemporary use set it apart from other Chilam Balam books.

surrounding the classification of current collection of Chilam Balam and/or other sacred Maya texts.

The specific contents of a Chilam Balam are determined based on a community's needs and interests, drawing from a wide range of sources. While there is a great level of variety between manuscripts, many of the common themes include religious texts (of Maya origin or Christian origin translated to Maya), rituals, books of saints, epistles, historical records, medicinal texts (of Maya, European, and Arabic influence), astronomical ideas, calendrical texts and tables, *katun*³ histories, astrological predictions and horoscopes, mathematics, myths, poems, chants, and literature. The *reportorios* containing descriptions of the world, chronologies, predictions, and medicinal remedies which were popular in Europe (GONZALBO AIZPURU, 2011) and transported to the Americas during the colonial period (RIVERA DORADO, 1986) have been identified as key sources of many Chilam Balam texts along with Maya grammars and dictionaries (BRICKER; MIRAM, 2002). Even the literary tale *A Thousand and One Nights* is copied and adapted in the Chilam Balams of Kaula and Chan Kan as well as the Pérez Codex (BRICKER; MIRAM, 2002). Victoria Bricker and Helga-Maria Miram (2002) suggest that the parallels between contents of European texts and the Chilam Balam of Kaula indicate similar concerns and intellectual interests between the two cultures and systems of ideas⁴.

The structure, sources, and contents of the Chilam Balam books, suggest that oftentimes these manuscripts were the product of various copies and annotations of previous documents. Basing his analysis on signatures, dates, and structural evidence, Barrera Vásquez (1948) notes that the surviving Chilam Balams were produced between 1544 and 1811 (as cited in LOVE, 1994). In the case of the Chilam Balam of Ixil, for example, it is believed to be copy created in the 18th century of a much older document and pulls from sources as recent as the *Biblia Vulgata Latina* from 1791 (CASO BARREAR, 2011). In the Chilam Balam of Chumayel, minor additions to the original text appear as late as 1838 (TEDLOCK, 2010). This is similar to the case of the almanac material in Maya codices which was constantly being modified to pertain to contemporary conditions (AVENI, 2011). It is likely that these manuscripts were re-copied from previous editions to compensate for possible wear and their contents modified over time to adjust to the dynamic intellectual interests of Maya communities and their ceremonial uses of the sacred texts. Because new information could be added to the main body of the text in a dynamic fashion, according to

³The word *katun* not only meant 'two dozen years, 'it also meant 'war'' (EDMONSON, 1986, p. 47).

⁴Nonetheless, while it is informative to analyze the reference materials used in the construction of the Chilam Balams it is also necessary to compare their language with that of "other Maya dialects, some of which, the Cakchiquel and the Tzeltal for example, preserve phonetically and semantically concepts which are classical Maya" (CRAINE; REINDORP, 1979, p. 9).

the criteria and knowledge of the local wise men, the Chilam Balam texts were constantly appropriated, compiled and adapted within a Maya worldview according to local custom.

Ultimately, the eclectic nature of the colonial Chilam Balams are indicative of the connections established between the so-called Old and New Worlds during the colonial period and the hybrid nature of knowledge production. Although written in the Maya language, the text made use of the Latin or Spanish characters the missionaries had taught the locals (TOZZER, 1921 as cited in CRAINE; REINDORP, 1979) as opposed to hieroglyphs. In many cases it is difficult to establish how many authors collaborated in the creation of the Chilam Balam manuscripts as signatures were not always present or corresponded to owners of the text as opposed to its authors; the Chilam Balam of Kaua is thought to have been compiled by at least five hands (BRICKER; MIRAM, 2002). This same Chilam Balam even has some commentary in Spanish that refers to the Maya as *they* suggesting that it was written by either a Spaniard or a Hispanicized Maya (BRICKER; MIRAM, 2002). We could even state that these intercultural encounters preclude colonial society as many of the Chilam Balam books describe the past encounters and histories between different Maya groups including the Itza and the Xiu.

Controversy and Upheaval of Chilam Balam Texts

The interest in these manuscripts and their *esoteric* knowledge, however, created demand from abroad (mainly the United States), leading to the disappearance and removal of numerous Chilam Balam from Maya communities, for sale, study, or private collections elsewhere. Many indigenous texts were acquired by the Yucatecan Bishop Crescencio Carrillo y Ancona who was interested in matters of Maya culture and relocated them to the Manuel Cepeda Peraza library in the capital city of Merida. The Chilam Balam of Ixil and the Chilam Balam of Tizimín, as was the fate of many of these manuscripts, however, disappeared from this collection and were sold to private collectors in the United States (CASO BARRERA, 2011). Although these two manuscripts did make it back to Mexico through donations, this was not always the case; the original manuscript of the Chilam Balam of Kaua, for example, disappeared from this library shortly after 1918 and still remains missing (BRICKER; MIRAM, 2002).

While the contents of these circulating Chilam Balam manuscripts have been analyzed in great detail, there is less ethnographic information about the ways in which communities have interacted with and made use of these text (mainly because these well-known Chilam Balam are precisely the ones that have been removed from their communities, oftentimes over a century ago). Mexican anthropologist Alfonso Villa Rojas

(1945) describes the 20th century practices of scribes to preserve and consult their *santo huun* or holy books, the “secretaries keep all these books and papers well wrapped up in cloths and well put away in a safe place (...) the secretaries enjoy a high social position” (as cited in LOVE, 1994, p. 6). Bruce Love also narrates a story collected during field work in 1983 in which a *jmeen* in eastern Yucatan was approached for help healing a sick woman. He used a set of numbers and signs from an old divinatory book called *El libro de los destinos* to counsel the worried visitors. “Maya priests before Columbus probably received visitors in the same way, as councilors and men of knowledge” (LOVE, 1994, p. 6).

RESULTS

The narrative of the disappearance and subsequent recreation of the unpublished *Chilam Balam* manuscript was retold to me during my various visits to Yucatan in 2015-2016; I am aware of other versions of the events, but this is the story as remembered and recounted by local informants.

Dislocation and Recreation of the Unpublished Chilam Balam Manuscript

In the case of this unpublished *Chilam Balam*, it was an integral part of community life before (and even after) its disappearance which is oftentimes dated towards the end of the 19th century or beginning of the 20th century. It was used in conversation and connection to other Maya communities; the manuscript was brought to other communities where it would be set down and let fall open to a certain page. The specialists would read the page and its contents served as a premonition or omen for what was to come. Apparently, an anthropologist visiting this community contacted the person in charge of the manuscript who did not authorize a reading of its contents, as the reading of the *Chilam Balam* was reserved for the *Day of the Cross* (for cultural as well as historical reasons — the manuscript was known to contain folios dating back to the 1600s). After establishing a relationship, however, it appears as though the anthropologist was able to borrow the manuscript, at which point he left with the text and was never seen again. Community members will not acknowledge this chain of events, however, and prefer to state that it was misplaced or lost while visiting another community.

The importance of this sacred text for the community, however, did not disappear with the physical loss of the manuscript. Through negotiations with Carlos Salinas de Gortari (the President of Mexico from 1988-1994) community members expressed their desire to recover their lost *Chilam Balam*; as opposed to receiving support for the construction of streets and highways, the recovery of this sacred text was their top priority. An investigation

into the disappearance of the manuscript was not successful in recovering it, but efforts were made to recompile the community's knowledge. Two anthropologists assisted in interviewing community members about the book, its contents, and other facets of Maya knowledge as preserved in the *tsikbal* tradition (conversations or oral tradition).

These findings were compiled by hand in ancient Maya (known as *suyua' t'aan* or pure language, making it difficult for even the present-day Maya speaker to understand or translate all of its contents), and bound using traditional methods with *u k'éewel kéej* (deer skin/leather) although as a joke it is sometimes referred to as *u k'éewel síinik* (ant skin). This reproduced manuscript was finalized in the early 1990s, and to avoid repeating history, was buried somewhere in the community along with the sacred cross. An official copy (financed by President Gortari and the federal government) as well as two other copies are kept elsewhere in the community. Access to the copied versions of the manuscript is still very limited; it is my understanding that while the community will usually talk about the text to those that show an interest, it is by invitation and generally considered a surprise when they will allow others to view the text.

Contents and Calculations of the Unpublished Chilam Balam

As informed by the Maya understanding of polysemy in which identity is multi-faceted, names have multiple meanings, concepts have multiple names, and knowledge is created and maintained through *tsikbal*, it is necessary to approach this Chilam Balam as a manuscript of multiple layers of meaning. This text brings together many fields of thought and is at the intersection of mathematics, astronomy, calendrics, astrology, literature, linguistics, and culture, among other ways of knowing. In addition, although currently in a print or fixed format, the text (and its multiple editions/versions) is the product of a dynamic conversation that has been carried out throughout history from pre-Colombian and colonial times to the present. Finally, as the product of many layers of translation (from ancient Maya to modern Maya to Spanish to English) the transcription and translation of sections of the unpublished Chilam Balam (as presented in the Appendices) are evident of the notion that any information exchange can obscure just as much as it can reveal.

Because of its unique contents (which I have not identified in other Chilam Balam books) and perspective (situated in the socio-cultural context of the 20th century), I have decided to reproduce the chapter on *P'elil Maya* (Maya Numbers) but recognize that much has already been lost in translation (for example, the classifier *p'éel* in Yucatec Maya refers to things, so that *p'elil* would be the count of things, not necessarily the abstract notion of *number*, which is generally conceived independent of material objects). All figures included throughout the translation are replicas made by the author. The format of the prose,

including line divisions, and relative placement of figures are maintained as best as possible. The original manuscript uses Maya numerals (bar and dot notation) in the upper right-hand corner to number each page, which I have replaced with Arabic numerals for ease of access (see Appendix 2).

Maya Numbers, Numerology, and Pedagogy in the Unpublished Chilam Balam

The table of numbers contained in this manuscript on page 75 is similar to that of the table of numbers of the Chilam Balam of Kaua, which had been copied verbatim from Beltrán de Santa Rosa's (1746) grammar (BRICKER; MIRAM, 2002). While the Kaua table of numbers compares the Maya and Spanish names of a sample of numbers from one to 215, this manuscript compares Arabic numerals to Maya numerals and Maya names for the numbers 0-59, 60, 80, and 100. While this could have been an effort to document the higher numbers in Maya which had been increasingly replaced by Spanish numbers as Bricker and Miram (2002) propose for the case of the Kaua text, because this unpublished manuscript includes the Maya numerals in bar and dot notation, which is used heavily throughout the entire manuscript with further explanation of this notation, this table of numbers could have been used as a pedagogical tool to introduce and further teach how to construct the bar and dot notation of Maya numerals (the bars and dots on the second level of notation, for example, are written with outlines to distinguish those bars and dots from the first level of notation).

While addition, subtraction, and multiplication (through aggregate addition) are evident in Maya mathematics through the use of distance numbers in monumental inscriptions, astronomical tables, and the positional notation itself (BRICKER; MIRAM, 2002) these concepts are explored through example as opposed to explicit instruction and practice (typical of a Western school textbook introduction to calculation). In the margin to the left of the Maya numerals on pages 77 to 81, additional annotations using Arabic numerals are used to show how the parts of Maya notation are multiplied and added together to create the total sum represented by the bar and dot notation. In this way, numbers are represented as a composite of parts as opposed to a static sign. The pedagogical value of this translation between Arabic and Maya numerals could be compared to the use of stackable unifix cubes used to teach math in elementary schools. In this way, through example and repetition, multiplication is not necessary to learn to how to represent numbers using Maya numerals, and perhaps it is not a coincidence that this manuscript does not have any multiplication tables like those copied from Beltrán de Santa Rosa's Mayan grammar (1746) in the Chilam Balam of Kaua (BRICKER; MIRAM, 2002).

Although the manuscript does mention the range of numbers that would require six levels of Maya bar and dot notation (3,200,000 to 59,999,999) on page 77, its illustrated examples of Maya numerals are limited to those of five or fewer levels of notation. This correlates to the use of the notation system in measuring calendar dates: the “system could be continued indefinitely, but it usually stopped with the fifth position because five places were sufficient for representing long-count dates” (BRICKER; MIRAM, 2002, p. 64). Not only were larger numbers not appropriate for counting calendrical dates, but some scholars have argued that there is no evidence that large numbers were used in counting noncalendrical items (BRICKER; MIRAM, 2002). In this unpublished Chilam Balam, the text does mention that large numbers were used by the elders to count the time, the years, the *katuns*, as well as the stars in the sky.

It would be detrimental to solely focus on the numeric aspects of the text that somewhat resemble Western mathematics “at the expense of paying too little attention to indigenous mathematics” (AVENI, 2011, p. 187); this manuscript also provides us with a detailed presentation of Maya numerology. In their exhaustive study of the Chilam Balam of Kaua, Bricker and Miram (2002) identify the “significance of the numbers 4, 5, 13, and 20” (p. 65-66), which this manuscript explains (except for 5) in addition to the importance of the numbers 0, 1, 3, 7, 9, 18, 19, 24, 52, 73, 104, 260, 312, 360, 365, 399, 400, 1993, 7200, 7999, 8000, 8760, 1113980, and 379600. Some of these symbols were connected to the natural world (like the 0 symbol represented by a snail figure and the number 1 connected to the ceiba tree) or the different levels of the sky and underworld (numbers 1, 7, 9). The numbers 3 and 4 both have connections to the number of gods or manifestations of gods⁵.

A majority of numbers find their significance in calendrical counts (numbers 13, 18, 20, 24, 52, 104, 260, 312, 360, 365, 400, 1993, 7200, 8000, 8760, 1113980, and 379600)⁶ and the rest of the numbers related to the first or last number that can be made in a certain level of the Maya notation system (19, 20, 399, 400, and 800) although there is some repetition between numbers with calendrical significance and those that initiate new levels of the notation system. Again, these explanations of the structural format of the bar and dot notation system seem to serve as place-markers for those learning to represent numbers with Maya numerals.

⁵It could be that this explanation of the number 3 as the “people that are in god” on page 77 of the manuscript is indicative of a Christian understanding of god, as opposed to the more traditional Maya numerology in which “4 had the same significance for the Maya as the number 3 did for the Europeans” (BRICKER; MIRAM, 2002, p. 65).

⁶As in the case of the Maya codices, with some exceptions, “it is almost exclusively in the realm of time that the Maya made use of number” (AVENI, 2011, p. 188).

Also of interest in this unpublished Chilam Balam is the use of Maya hieroglyphs to symbolize certain counts of time. Dennis Tedlock (2010) has noted that books of the Chilam Balam generally only include the sign for lord (*ajaw*) with the exception of the Chilam Balam of Maní which contains signs for the twenty day names, but in an abstract version of the originals. In addition to the twenty day names, this unpublished Chilam Balam presents hieroglyphic symbols for the counts of days, months, years, *katuns*, *nicté katuns*, and *oxlakatuns* (see Appendix 1).

Just as the colonial Chilam Balam books were used as a counsel, influenced by Maya and European ideas, this chapter on *Maya Numbers* of the unpublished Chilam Balam of modern times reads as a guidebook for understanding and learning Maya numerals and numerology in a context highly influenced by Arabic numerals. As such, this text would be appropriate for use in contexts of mathematics learning and education. As an interdisciplinary and ethnomathematical source, this text is effective in translating some of the mathematical ideas, procedures, and practices of the Maya to a broader audience; the study of its contents would reveal ways of mathematizing reality within an alternative cultural framework as well as aspects of the Maya numeric intellectual traditional that have been hidden by a more canonical Western history of mathematical knowledge. Finally, this text, in light of its many recompilations, translations, and influences is evidence of the fact that although the history of mathematics is all too often oversimplified and attributes numeric achievements to individuals and groups operating independently of one another, mathematical thought oftentimes develops in hybrid contexts of conversation and connections between people, sources, and disciplines.

FINAL CONSIDERATIONS

As a scholar, I recognize the need for a more precise translation of *Maya Numbers*, as well as an exhaustive study of the contents and sources of the entire manuscript; such a study would contribute greatly to our understanding of the Chilam Balam books as well as the specific sociocultural context of this Maya community that undertook its creation and recompilation. Although it can be problematic to designate such a modern text as part of the Chilam Balam collection (compiled of texts and sources mainly dating to the colonial period), it may be more productive to consider this text as a continuation of the Chilam Balam tradition and practice of compiling and collecting sacred texts in Maya communities of Yucatan. A comparison between this compilation and colonial compilations could reveal how the criteria, knowledge, and traditions regarding a community's preservation and use of sacred texts have changed over time. On the other hand, however, I recognize that the sharing and dissemination of knowledge is not done in isolation but rather woven into a

complicated web of geopolitics and discourses of dominance that influence which voices in that conversation are heard and valued, oftentimes leading to tensions, misunderstandings, controversy, and even plundering between the Western and non-Western divide.

This study of the contents of the sacred texts of the Maya known as the Chilam Balam, as well as the story presented surrounding the circumstances of the disappearance and recommissioning of this unpublished Chilam Balam, are evidence of the destructive potential of encounters between people and exchanges of information. This destruction was first evidenced by Maya writers in the Chilam Balam of Chumayel who commented on the *robbery with violence* initiated upon the arrival of Spaniards:

(...) misery was introduced, when Christianity was introduced by the real Christians
(...) It was the beginning of tribute, the beginning of church dues, the beginning of strife with purse snatching, the beginning of strife with blow guns, the beginning of strife by trampling on people, the beginning of robbery with violence, the beginning of forced debts, the beginning of debts enforced by false testimony, the beginning of individual strife, a beginning of vexation, a beginning of robbery with violence (ROYS, 1967 as cited in CRAINE; REINDORP, 1979, p. xiii).

This framework of violence extended to Maya intellectuals as well, as noted by Bruce Love (1995): “possession and use of hieroglyphic books was punished by torture and death” (p. 5). We could say that this robbery was repeated upon the onset of outside scholars interested in acquiring original sacred texts from Maya communities; while many of the acquisitions took place in the context of a sale or exchange of favors, the reactions of the community members in the case of the disappearance of this unpublished Chilam Balam are evidence that something valuable was seized from them without consent.

In this way, we must not take our work of intercultural dialogue lightly, but consider the ways in which we are able to promote diversity of thought and re-write intellectual history while contributing to both sides of the exchange instead of subtracting from one side or the other. As a metaphor, perhaps instead of acquiring, purchasing, or plundering the sacred texts of others (like happened to many of the original Chilam Balam manuscripts at the hands of outsiders and scholars) we can study, recompile, appropriate, and share copies of outside knowledge (using as an example the original authors of the Chilam Balam books who incorporated outside sources into their texts and promulgated this knowledge to the community through public acts and ceremonies). We should consider the reproduction of parts of this unpublished Chilam Balam in the same light: as an opportunity to study Maya numerals, bar and dot notation, numerology, and glyphs, as appears was the intent of the text’s contributors.

Whether in the context of future research or education initiatives, it is my hope that the community's voice is strongest when speaking about this Chilam Balam and that further *tsikbal* leads to more genuine exchanges of information; publishing and disseminating intellectual work in the scholarly realm or teaching and exposing alternate ways of knowing in the school systems cannot be the sole objectives that take precedent over the priorities of those most closely associated with the knowledge, but rather the priorities of all contributors of the dialogue must be taken into consideration.

In a lecture I attended recently about Dakota/Lakota sacred sites and knowledge the speaker was hesitant to share certain ideas with the audience and stated that there is a danger for indigenous intellectuals to share and translate all their knowledge because then they will lose that part of their identity that makes them who they are. It is precisely through connections and conversations under the guise of the Maya principal of *tsikbal* which emphasizes mutual respect (*tsiik*) that communities, scholars, and educators can work together to combat the destructive dynamic of unequal power relations in cross-cultural encounters and promote intellectual diversity.

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APPENDICES

Appendix 1: *Translation of Symbols of Time of the Unpublished Chilam Balam*

[90]

[...] Such is the long count of time, you can count them since the true god created the world until the day in which he disappear perhaps within many *pictuns*, or *kinchiltuns* of years.



Any of these symbols means day.



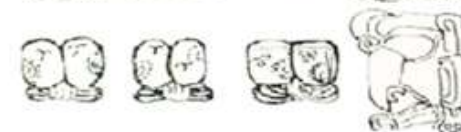
Any of these symbols means month.



Any of these symbols means year.



Any of these symbols means *katun*.



Any of these symbols means *Nicté Katun*.



Any of these symbols means *Oxlakatun*.
















Appendix 2: Translation of “Maya Numbers” of the Unpublished Chilam Balam




[74]


Maya Numbers







[75]







The Maya numbers go from one to twenty. Not from one to ten like the numbers in Spanish. The symbols and the names of the numbers are done in the following way:

| | | |
|---|--|---|
| 0.  = zero | 20.  = twenty | 40.  = forty |
| 1. • = one | 21.  = twenty one | 41.  = forty one |
| 2. •• = two | 22.  = twenty two | 42.  = forty two |
| 3. ••• = three | 23.  = twenty three | 43.  = forty three |
| 4. •••• = four | 24.  = twenty four | 44.  = forty four |
| 5. — = five | 25.  = twenty five | 45.  = forty five |
| 6.  = six | 26.  = twenty six | 46.  = forty six |
| 7.  = seven | 27.  = twenty seven | 47.  = forty seven |
| 8.  = eight | 28.  = twenty eight | 48.  = forty eight |
| 9.  = nine | 29.  = twenty nine | 49.  = forty nine |
| 10. == = ten | 30.  = thirty | 50.  = fifty |
| 11.  = eleven | 31.  = thirty one | 51.  = fifty one |
| 12.  = twelve | 32.  = thirty two | 52.  = fifty two |
| 13.  = thirteen | 33.  = thirty three | 53.  = fifty three |
| 14.  = fourteen | 34.  = thirty four | 54.  = fifty four |
| 15. == = fifteen | 35.  = thirty five | 55.  = fifty five |
| 16.  = sixteen | 36.  = thirty six | 56.  = fifty six |
| 17.  = seventeen | 37.  = thirty seven | 57.  = fifty seven |
| 18.  = eighteen | 38.  = thirty eight | 58.  = fifty eight |
| 19.  = nineteen | 39.  = thirty nine | 59.  = fifty nine |

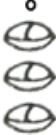
60.  sixty
80.  eighty
100.  one hundred/a hundred


The numbers are written by twenties. The ones found below are one through nineteen, above the completions or twenties are placed. Above that, the completions of twenty. Much higher above, the twenties of the completions of twenty. When there is no number below, a zero  is placed: like:


1. • 19.  20.  30.  35.  80.  85. 


100.  200.  250.  300.  359.  400. 

Large numbers

8,000 eight thousand 

160,000 one-hundred sixty thousand 

3,200,000 three million two-hundred thousand 

64,000,000 sixty four million 

With these large numbers the grandfathers read the time, the years, the *katuns* and the stars that are in the sky.

All these numbers from four-hundred (400) to seven thousand nine hundred ninety nine (7,999) are written in three levels.

All the numbers from eight thousand (8,000) to one hundred fifty nine thousand nine hundred and ninety nine (159,000) are written in four levels.

All of the levels from one hundred sixty thousand (160, 000)

to three million one hundred ninety nine thousand, nine hundred ninety nine (3'199,999) are written in the fifth position.

All the numbers from three million two hundred thousand (3'200,000) to fifty nine thousand nine hundred ninety nine (59,999,999) are written in the sixth position.

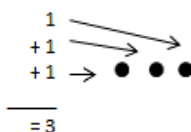
Numbers are written the following way:



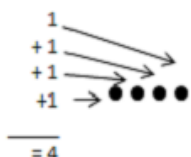
Zero. This snail that is nothing, means zero.



One. God *Hunab ku'* like in the branches of the ceiba tree (known in Maya as *yaxche'*) are the seventh sky, the roots are related to the eighth underworld. The trunk is connected to the earth and the sky.



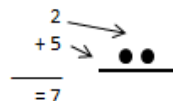
Three. These are the people that are in god (the *oxlajun ti kú* (the thirteenth deity, like the celestial god the thirteenth deity, like the celestial god) the sacred cross of rock.



Four. These are the four paths of *balcah* as well as the four colors (black, red, white and yellow); like the four ceiba trees that sustain the *balcah*; like the four guardians that protect the town; like the four gods of the rain;

[78]

like four *ah tocob*; like the four carriers of the year, like the four *Bacabes*.



Seven. Like the seven skies; in the last sky *Oxlahun ti kú*, *Hunab Kú* is found, the true god, *Cháak*, *itzamná*, *kakmó*, they are the three people in one.

$$\begin{array}{r} 4 \rightarrow \\ + 5 \rightarrow \\ \hline = 9 \end{array}$$


Nine. Like the nine children of the underworld. In one of them

$$\begin{array}{r} 3 \rightarrow \\ + 5 \rightarrow \\ + 5 \rightarrow \\ \hline = 13 \end{array}$$


Thirteen. This is the number that is counted in the days of the *tzolkin* (This is the maya ritual calendar). The numbers of the *Ahau katun* make an *Uudz Katun*. An *Uudz Ahau katun* of the short count.

$$\begin{array}{r} 3 \rightarrow \\ + 15 \rightarrow \\ \hline = 18 \end{array}$$


Eighteen. These are the months that a year has.

$$\begin{array}{r} 4 \rightarrow \\ + 15 \rightarrow \\ \hline = 19 \end{array}$$



Nineteen. This is the last number that can be made (placed) in the first level of Maya numbering.

$$\begin{array}{r} 20 \rightarrow \\ + 0 \\ \hline = 20 \end{array}$$


Twenty. The numbers that go from zero to nineteen are the same base or root of the Maya numbers. This is the first number that is placed on the second level.

A month has [20] days. A *katun* has [20] years in the long count.


[79]

$$\begin{array}{r} 20 \rightarrow \\ + 4 \rightarrow \\ \hline = 24 \end{array}$$


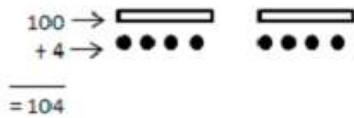
Twenty four. Years is what an *Ahau Katun* has.

$$\begin{array}{r} 40 \rightarrow \\ + 12 \rightarrow \\ \hline = 52 \end{array}$$

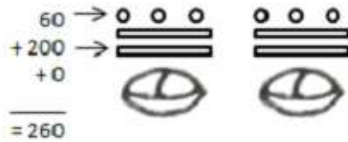

Fifty two. These are the number of years that make a *Buc xoc*.

$$\begin{array}{r} 60 \rightarrow \\ + 13 \rightarrow \\ \hline = 73 \end{array}$$


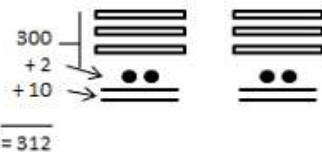
Seventy three. These are the numbers of *Oxlakatonob* that make a Maya day (*Kin* or *k'iin* means day, number, and time).



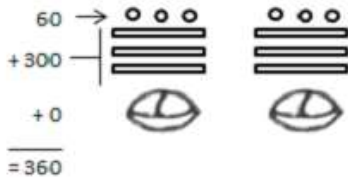
One hundred four. Two *Buc xoc*, this is the *kisil* of an artist.



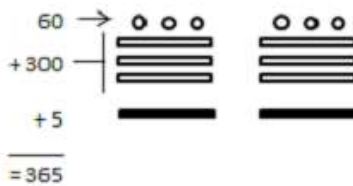
Two hundred sixty. These are the days in the *tzolkin*.



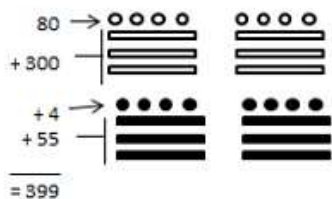
Three hundred twelve. These are the years in an *Uudz katun*.



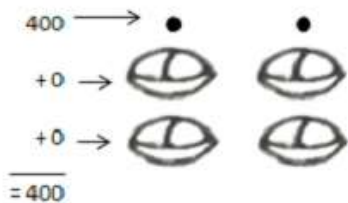
Three hundred sixty. These are the number of days in a year in the long count.



Three hundred sixty five. These are the number of days in a year in the short count.

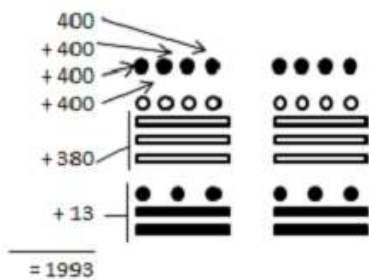


Three hundred ninety nine. This is the last number that can be put in the count of the second level of Maya numbering.

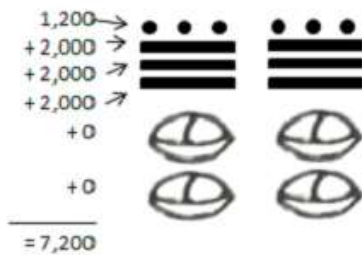


Four hundred. This is the first number that can be made in the count of the third level of Maya numbering. These are the number of years in a *Nicte Katun* in the long count.

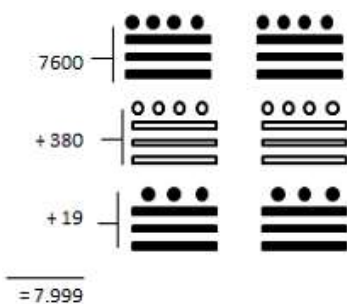
[80]



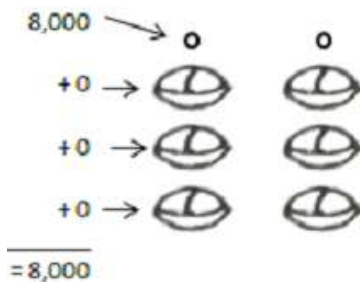
One thousand nine hundred ninety three. These are the years in which we write this (referring to this book).



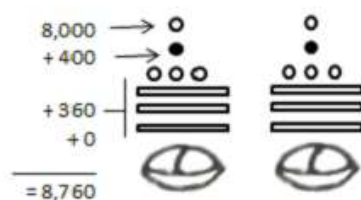
Seven thousand two hundred. This is the number of days that are in 20 years, [7200] makes a *katun*



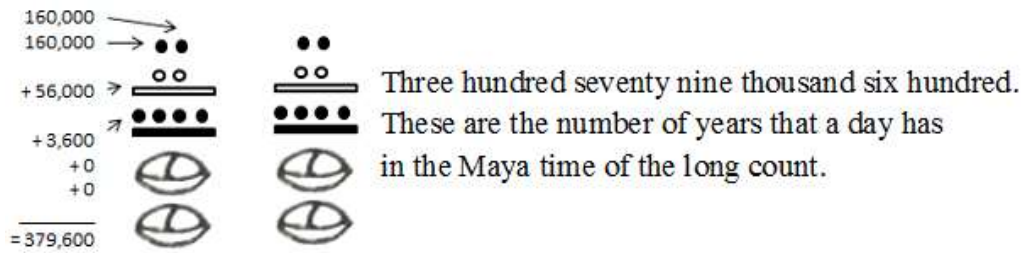
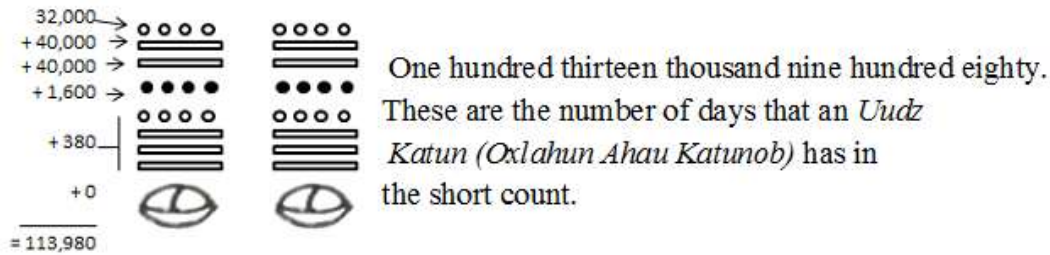
Seven thousand nine hundred ninety nine. This is the last number that can be written on the third level of Maya number (I preserved the notation as it appears in the manuscript, including the missing dot to make 19).



Eight thousand. These are the number of *katuns* that make a *Pic katun*. This is the first number that corresponds to the fourth level of the Maya numbers.



Eight thousand seven hundred sixty. These are the number of days of an *Ahau Katun* (twenty four = 24 years), in the short count.



Acknowledgment

I am greatly indebted to the many friends and experts who shared their knowledge, time, and culture with me.

¹The grammatical and editorial revisions of this article were made by Daniel Clark Orey and Milton Rosa (UFOP).