The PARI Journal

A quarterly publication of the Ancient Cultures Institute
Volume XXIV, No.3, 2024

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PAGES 1–12

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Electronic version
available at:
www.precolumbia.org/
pari/journal/2403

ISSN 1531-5398

The Use of Photogrammetry in the Reading of Maya Monuments: The Case of Naachtun, Guatemala

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During the 2022 field season at the Classic Maya Center of Naachtun, in Northern Petén, Guatemala, we experimented with a photographic survey of a stone monument, Altar 8, first documented as plain by Sylvanus Morley (1937–1938). The idea was to use a photogrammetric technique that enhances small stone reliefs to test if a monument had been sculpted in the past. We chose to employ this technique on Altar 8, a monument dated to the Early Classic period, associated with Stela 22 at the foot of Structure III, in Group C, because it had four cutouts on its side representing quatrefoil motifs. After very positive results showing iconography and inscriptions on top of the altar (Nondédéo et al. 2023), which brought us new data on the origins of the Naachtun 'Bat' dynasty, we applied the same method in the 2023 field season to other early monuments, in particular Stela 22 and Stela C7, both located in Group C.

Northern Petén in Guatemala is among the most remote regions in the Maya area, with difficult access and few trails available to reach Maya settlements. Due to this particular context, documentation of stone monuments can be highly challenging. It is for instance complicated to bring to the field heavy, bulky and/or fragile equipment such as a 3D scanner. A good option to overcome these logistical constraints is the use of photographic surveys which can be converted into 3D photogrammetric models. This inexpensive method can provide very good quality and very accurate models given the field acquisition context. In this paper, we will show how some new treatments performed on photogrammetric models can provide new historical data about Naachtun's Early Classic dynasty, using, in particular, GIS software.

The Setting

Naachtun is a large Maya regional capital founded at the end of the Late Preclassic period, circa. 150 CE, and the seat of a

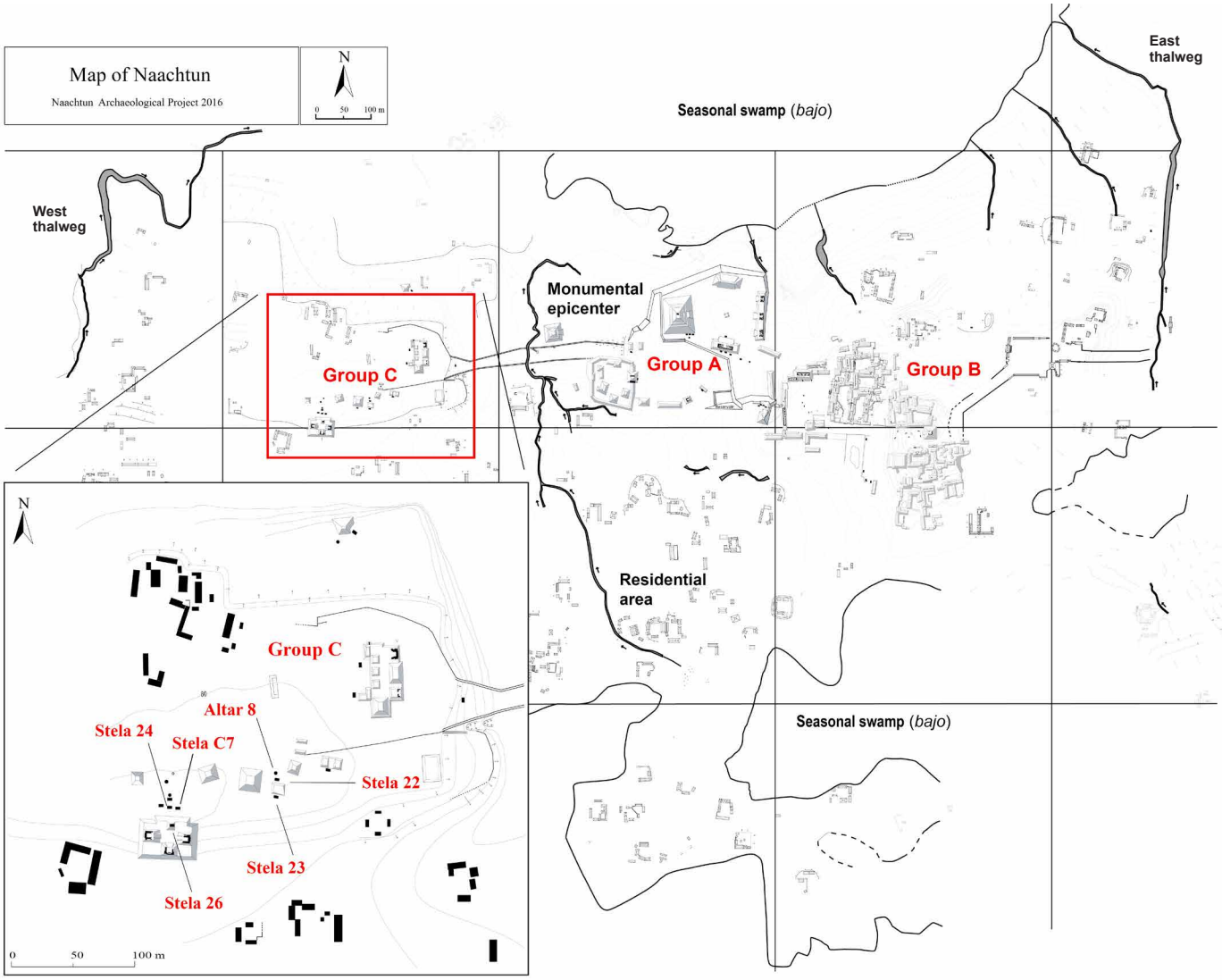

Figure 1. Map of Naachtun urban core with emphasis on the stelae present in Group C (map by Naachtun project modified by Philippe Nondédéo).

powerful dynasty, the 'Bat' kings, a dynasty mentioned at various cities in Northern Peten and Southern Campeche during the Classic period (Grube 2005; Martin 2005; Nondédéo et al. 2021). This dynasty was responsible for the dedication of more than eighty stone monuments (stelae and altars) that have been documented sporadically during the twentieth century (Morley 1937-1938; Ruppert and Denison 1943) and more systematically since the 2000s with the start of Kathryn Reese's project (Mathews and Parmington 2005) and the beginning of ours in 2010 (Cases and Lacadena 2014a, 2014b; Patrois 2020). Unfortunately, all of these monuments were sculpted in a poor-quality limestone and are now badly eroded. Only a few of them preserve inscriptions or iconography, so that most of them were considered as plain by the first archeologists who visited Naachtun in the 1930s.

Naachtun is composed of three main monumental Groups, labelled A, B, and C, which form the epicenter, surrounded by a vast residential area. Group C represents the seat of the dynasty with its Triadic Complex and its royal funerary acropolis, Structure V, during the Early Classic period, while Group A represents the political-public space during the same period with its ball court and its E-Group. Finally, Group B, in the eastern part of the city is Late and Terminal Classic in occupation. The 2023 work on stone monuments focused on Group C and on some of its earliest stelae (Figure 1).

Stela 22

Associated with Altar 8 at the foot of Structure III, a low platform without a built superstructure on top, Stela 22 is still in upright position, north of the building. It is

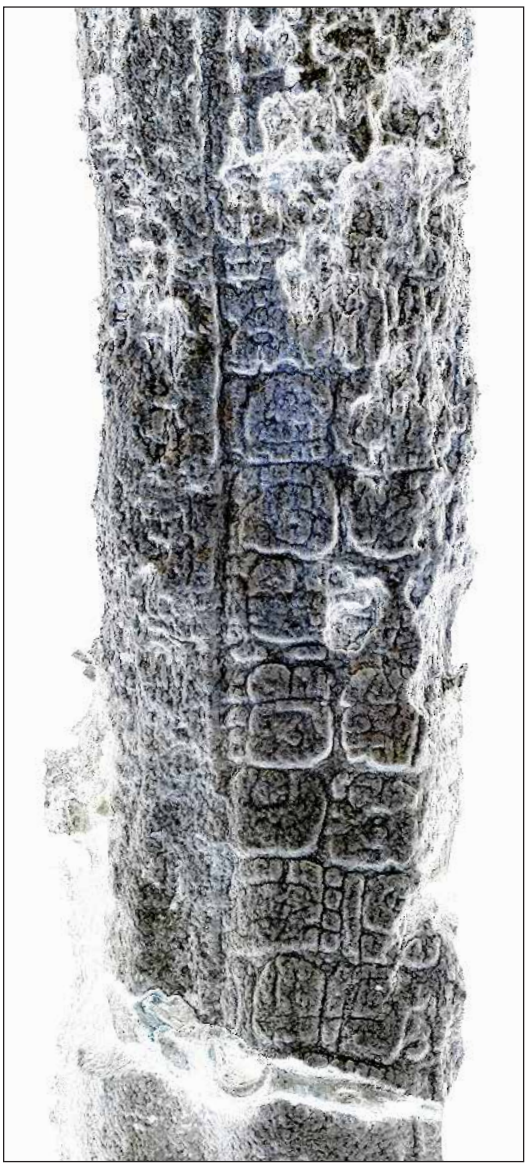

Figure 2. Photogrammetry of Stela 22, East (Hemmamuthé Goudiaby and Julien Hiquet).

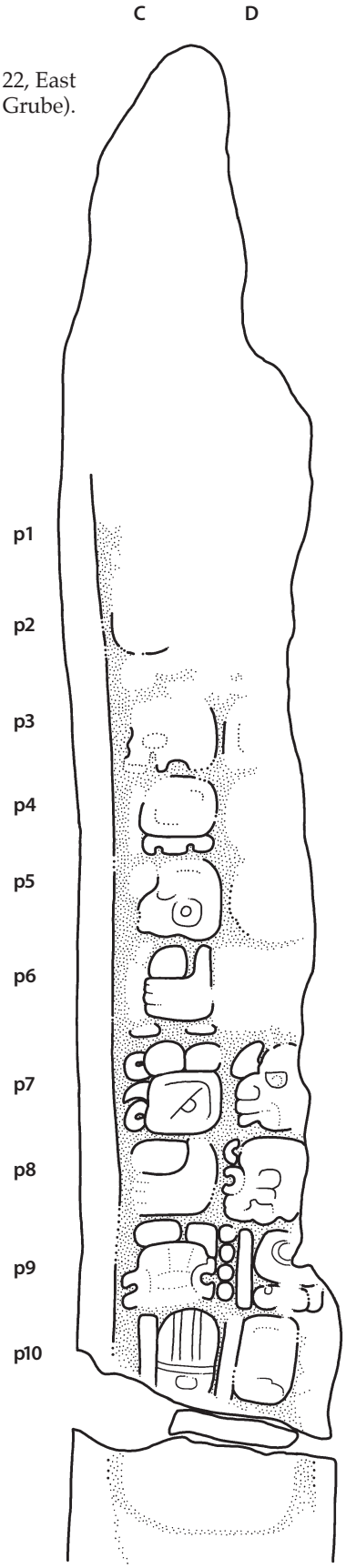

Figure 3. Drawing of Stela 22, East (drawing by Nikolai Grube).

2.98 m high (without considering the stela butt), 1.10 m wide, and 0.55 m thick. No design survived on its front face, while the sides still bear inscriptions. Most of them have now disappeared except for the lower part of the right (east) side. If we assume that Stela 22 was paired with Altar 8, this stela is likely to also have an early date, considering that the Long Count date present on Altar 8 is 8.16.?.?.? (Nondédéo et al. 2023:19-20). This probable early date is also reinforced by the presence of another early monument, Stela 23, also associated with structure III and dated to 8.16.4.10.1 6 Imix 4 Zec (361 CE) (Nondédéo et al. 2019:55).

Due to the instability of Stela 22 caused by root action which fractured part of its base, we decided in 2015 to wrap a geotextile around the base and to build a small stone wall at the bottom of the stela (Colin 2016:556-559). All of these preventive constructions were removed in 2023 and the stela was cleaned and gently brushed using a water-alcohol solution in order to get the best stone surfaces for the photographic survey (Blaisot et al. 2023:229-231). In this case, a treatment based on mesh visualization with Meshlab software (radiance scaling shader) provided a satisfying model for the reading of the preserved inscription on the right side (Figure 2). A total of ten rows of glyphs is now visible, not all clearly readable. The total number of rows that once existed can no longer be discerned. Unfortunately, the existing hieroglyphs contain no clear dates, so that we not only lack a chronological framework, but are also lost in regard to the syntax (Figure 3).

The first glyph which can be identified with some certainty is located in position Cp6 and is based on the hand sign 0670st in the digital sign catalogue of the

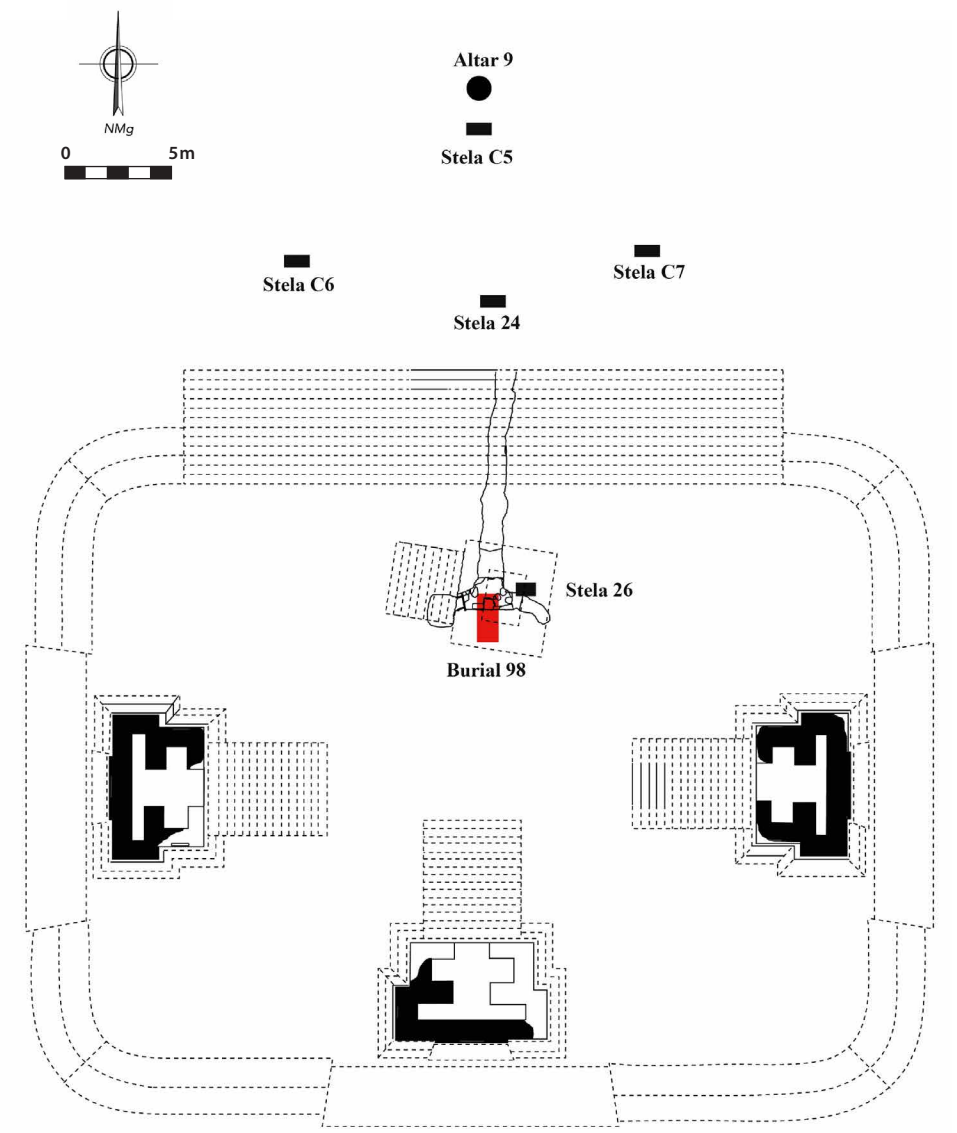

Figure 4. Monuments associated with the Triadic Complex (map by Céline Gillot, D. Michelet, and Julien Hiquet, modified by Philippe Nondédéo)

Textdatenbank und Wörterbuch project.[1] Depending on context and affixation, it can read either **CH'AM** "take" or **YAL** "child of mother" and "throw." Although the prefixes attached to it are not easily recognizable, it seems that the prefix before the hand sign is a variant of the **u** sign, suggesting that the reading of the hand is the transitive verb root **CH'AM**. The two oval shaped signs below it could represent some verbal suffix. The entire hieroglyph probably reads "he takes it." The next hieroglyph unfortunately is eroded beyond recognition. If this would have been a **K'AWIIL** head, both hieroglyphs would provide a full accession statement "he takes K'awiil" that is widely known from the Maya lowlands.

The name and titles of the potential protagonist are given in the following hieroglyphs (Cp7–Cp9). The first two hieroglyphs spell the name **ya**-**AJAW**-**TE' K'IHNICH**, Yajawte' K'ihnich, "lord of the tree of the Sun God" or "he from the family of the Sun God." This name is followed by a turtle carapace with a superfix, which is probably still a part of the nominal phrase. The last three hieroglyphs seem to indicate some chronological count or Distance Number (**9 K'AL**-**wa** 5 **HAAB**, 5 **WINIK**-**ki**), although the sequence of time periods seems to be in disorder.

The possible "taking of K'awiil" by a Yajawte' K'ihnich could refer to the accession of a king by this name. The absence of a date before the potential verb, however, is unusual for such important historical events. Also, there is no clearly recognizable emblem glyph or toponym after the king's name, unless it rests undiscovered in one of the following hieroglyphs.

This inscription suggests first that king Yajawte' K'ihnich is probably the protagonist represented to the right of the scene on Altar 8 as the owner of the monument, and the one who received power and authority from the ancestor placed in front of him. Second, Yajawte' K'ihnich, enthroned on Stela 22, is probably the same ruler mentioned on the nearby Stela 23, which is also associated with platform III. In this respect, Stela 23 would be a little bit later than Stela 22. Third, if Stela 22 mentions the investiture of Yajawte' K'ihnich, we can thus infer that the date present on Altar 8 is probably not a katun-ending, that is 8.16.0.0.0, but a precise date which would recall the accession ceremony between 8.16.0.0.0 and 8.16.4.10.1, the date of Stela 23, the next stela erected. Fourth, as we have not found any burial chamber under Structure III after excavation and documentation of a looters' trench, and as we note the presence of three monuments dedicated in a short period of time, we can infer that this structure may have played a key role for

[1] https://classicmayan.org/zeichenkatalog/

Figure 5. State of conservation of Stela C7 when we began the Naachtun Archaeological Project in 2010 (photo by Mariana Colin)

this ruler: why not the place for celebrating his enthronization? Structure III is actually a low platform decorated with apron moldings and opening to the north. The 2023 excavations established the absence of any superstructure on top, just the interior fill outcropping in the superficial layer of humus. Details about investiture ceremony contexts are very scarce in epigraphy and archaeology, and what is interesting to note is that during the first part of the Early Classic period, there are few examples of enthronement that took place on public platforms, specifically in Teotihuacan with the Adosada (Fash et al. 2009:210). While we do not know if the same practice was shared between the Maya and Teotihuacan, we can just mention the strong links between Naachtun and Teotihuacan during the Early Classic period, as shown by a high variety of Teotihuacan influence in the material culture uncovered around Structure III (Hiquet 2022).

Stela C7

Stela C7 is one of the five monuments (along with Stelae C5 and C6, Stela 24, and Altar 9) erected to the north at the foot of the Triadic complex (Figure 4). Stela C7 is just 10 m east of Stela 24, which gave us key information about the role of Naachtun in the takeover of Tikal in 378 CE (Nondédéo et al. 2019). Stela C7 lays on the ground, the front face-down, and is broken in two main fragments, plus additional smaller ones. In 2015, we decided to free the stela from the roots of a ramón tree which broke half the monument transversally (Figure 5). After covering the stela with a geotextile, we buried it with stones and sediment in order to cause the remaining roots to rot (Colin 2016:558-559). Suspecting the presence of inscriptions on its front face, we decided to unearth the monument in 2023. This work done, we reset the two main blocks, with the front face up, and attached the minor fragments with a plaster mold (Blaisot et al. 2023:229-231). The front face was then cleaned and brushed using a water-alcohol solution, and the small fragments removed from the stone surface were attached with a solution of 20% Paraloid B72 in acetone.

Stela C7 once held an inscription of 36 glyph blocks. Most can be deciphered, except around the break location. After a photographic survey, and in order to restore as far as possible the glyphic information uncovered on its front face, we used photogrammetry to produce a 3D model of the stela surface. Then, visualization and analysis were pursued by two different methods. A more classical one was based on interactive enhancement of the model aspect. We used Meshlab (Cignoni et al. 2008) and its multiple shader effects, especially

"Radiance Scaling" (Vergne et al. 2010) which heightens contrast and makes details more readily visible. Since this method is fully interactive, it is a great way for models exploration and close-up views. Export from Meshlab is simple, giving us a better way of sharing this data. It works in most cases but in the case of stela C7, we had to go beyond what this traditional method could offer. Radiance Scaling is a great way of enhancing small details but we needed a stronger and more systematic way of showing partially erased details, which is why we decided to turn to GIS techniques.

We used in particular the RVT (Relief Visualization Toolbox), developed by Kokalj and Somrak (2019) which provides multiple visualization methods that can be set semi-automatically. Models using multi-oriented shading, slopes, Sky View Factor, and Simple Local Relief Model were thus generated. The multiplicity and overlapping of these new layers are a great way of discovering new features on the stela. Meshlab was then used for the reconstruction of Stela C7, to manually reunite the different fragments with a very satisfying precision (Figure 6) (see Nondédéo et al. 2024 for methodological details of the different visualizations).

The inscription clearly begins with a full Initial Series and a Long Count of 9.3.13.0.0 (November 24, 507) and the introductory ISIG in A1 (Figure 7). The corresponding day, 2 Ahau, is in A4. It is followed by the hieroglyph for the ninth "Lord of the Night" (B4).

The break that divides the monument has destroyed most of the two following glyphs. According to the standard syntax of the Initial Series, the hieroglyph for the "Lord of the Night" should be followed by Glyph F. Faint remains of a **na** suffix (as a complement to **u**-**TI'**-**HUUN**-**na**) can still be recognized. The text should then continue with Glyph D with the reading **HUL**-**li**-**ya** "arrived" as the first hieroglyph of the Lunar Series. Glyph D provides the age of the current moon. The coefficient is not recognizable, but according to calculations it must be "1," a coefficient which often is not written because it is assumed by default (Thompson 1950:237).

The next two blocks also correspond to the familiar pattern. In A6 we see the outline of glyph C (the grouping of lunations into cycles of 6) and then in B6 and probably also A7 Glyph X, which always accompanies glyph C and also refers to cycles of six lunations. The hieroglyph in A7 shows faint traces of a moon sign in the lower half, an element which corresponds to Glyph X-vi (Grube 2018). As expected, it is followed in B7 by glyph 9A, which indicates the length of the lunation as 29 days. The last block belonging to the Initial Series date appears in A8 and is the month 13 Ceh of the date 9.3.13.0.0 2 Ahau 13 Ceh.

In the next block, the verb is expected. Although the details are hard to see, the final sign without doubt is the syllable **ja**. The outlines of the signs above suggest the presence of a **ma** syllable and another syllable below. For several reasons this seems to be the verb **ma**-**ka**-**ja**, *ma[h]k-aj*, "it is covered" or "it is closed." The subject of the sentence is in the next glyph. Although half of it is destroyed, the remains seem to indicate the main sign **WAY**?,[2] which is based on the representation of the curved mandibular claws of tropical centipedes. The sign is used to identify the entrance to the underworld, or specific architectural spaces that emulate the portals to the underworld. In Yucatan, the same construction *(mahkaj u way)* appears on at least nine painted capstones from vaults in buildings at Ek Balam, suggesting that the phrase can also refer to a ritual associated with the closing of corbeled vaults (Carrasco and Hull 2002). This idea is supported by the discovery of a short text reading **ma**?-**ka**-**la** **u**-**WAY**-? "it is the closing? of the vault" on a carved capstone from Buenavista del Cayo, Belize (Helmke 2018). In this text, the possessed form of the **WAY** glyph precedes what seems to be the name of Structure 4, where the capstone was found (Helmke 2018:139). Other related phrases appear on Copan Stelae A and J, on Machaquila Stelae 2, 5, and 7 as well as on La Corona Stela 1. In all these contexts we find the glyph *u-way* "his cache" or "his vault" as subject of various derivations of the verb *mak-* 'to close' (Figure 8). The context on Copan Stela A is particularly interesting because it refers both to the opening and closing of a cache or a vault during the next Lajuntun-ending in the future: *ha'ob pasnom u way, maknom u way* "these *way* will be opened, these *way* will be closed." On Copan Stela J, the closing of the *way* is listed as a ritual activity associated with the ending of the 13th Tun. This is of great relevance in comparison with Naachtun Stela C7, where the first *mahkaj u way* ritual is also connected to a 13 Tun ending.

After this phrase, in B9 there is a single glyph 1 Baktun. Its meaning is not very clear, although the most likely interpretation is as a distance number that connects us with a date in the distant past. However, it is not a regular distance number, since it would imply that the periods are not arranged in ascending order as in regular Distance Numbers (Thompson 1950:148). However, irregular Distance Numbers with periods in descending order are not completely absent and

[2] The **WAY** reading for the centipede claw sign listed as T769 in the Thompson (1962: 369-370) catalogue is used here in the absence of a better proposal. The decipherment of this sign as **WAY** was proposed by Barbara MacLeod (Macri and Looper 2003). The reading is based on the occurrence in the hieroglyph for the month Wayeb, which was probably spelled **WAY**-**HAAB** in the Classic Period. However, except for this argument, the occasional **ya** suffix probably representing a phonetic complement, and the fact that *way* also means "cell" and "chamber" in Yucatec, no further evidence can be provided to support this decipherment. The sign never substitutes with the well-established **WAY** logogram T539, nor does it ever appear with a prefixed phonetic complement, such as almost all other logograms with an initial semi vowel like /*w*/ (Grube 2010: 29-31). The fact that the sign often appears with an infixed **la** syllable might suggest a logographic value ending in either *-yal* or *-lay*.

Figure 6. Photogrammetry of Stela C7
(multi-orientation by R. Mereuze)

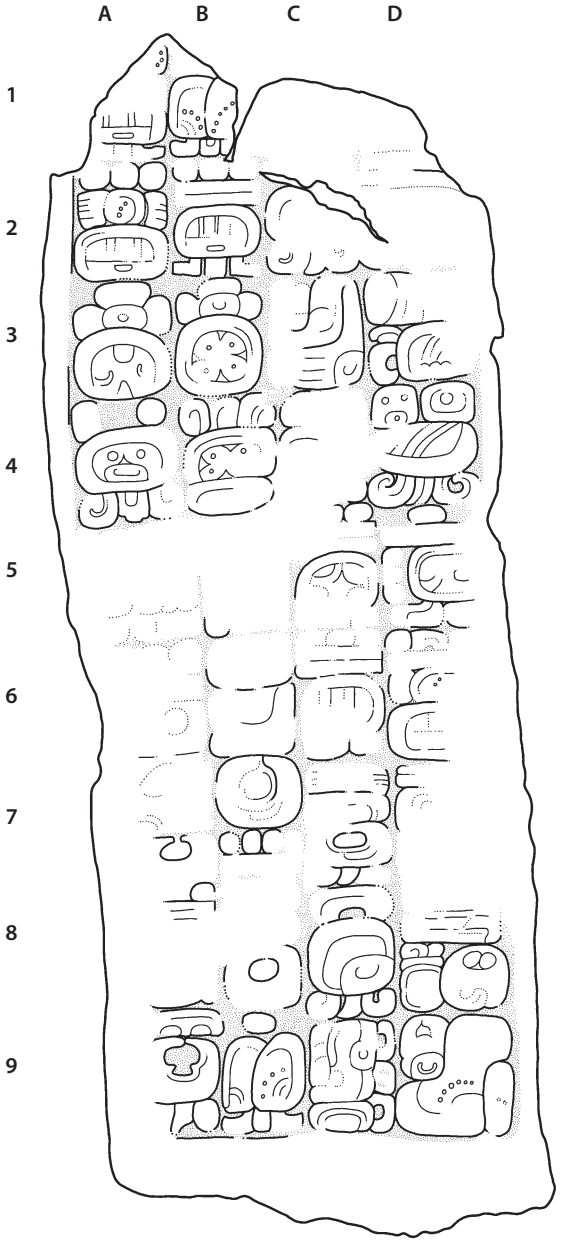

Figure 7. Drawing of Stela C7
(drawing by Nikolai Grube)

are known from Palenque and Lamanai. If the Baktun glyph in B9 is the beginning of a descending Distance Number, the following period glyphs would have been in the glyphs C1–D2 on the top right of the monument. Unfortunately, this is also the most eroded part of the entire text and there is hardly anything that can be used to corroborate the existence of such a Distance Number, except perhaps two faintly visible lines in D2 which could suggest a K'in coefficient of 10. If we assume that this hypothetical Distance Number connects with the Initial Series date, the coefficient 10 of the K'in period would connect with a Calendar Round date whose day sign would have been Oc. However, no day Oc can be recognized on the monument, therefore the Distance Number including the Baktun glyph remains a mystery. The next hieroglyph after the hypothetical Distance Number seems to be a verbal expression based on the hand sign 0670st, reading **CH'AM** or **YAL**. The hand holds or presents some kind of object. This could be a stylized **K'AWIIL** head, identifying this hieroglyph as a "taking of K'awiil" accession expression. The prefix in front of the hand could be an **u** prefix to present the

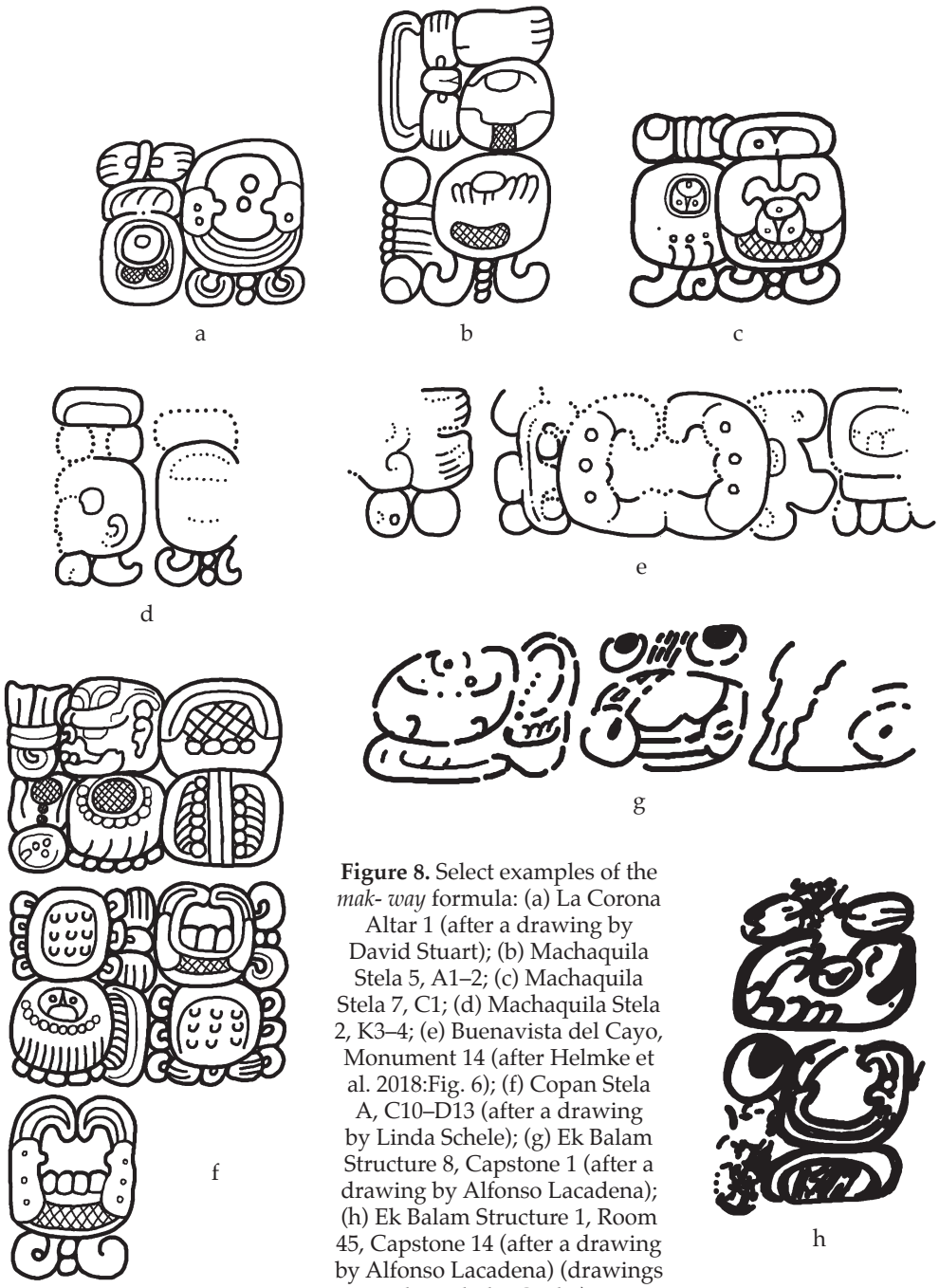

Figure 8. Select examples of the *mak- way* formula: (a) La Corona Altar 1 (after a drawing by David Stuart); (b) Machaquila Stela 5, A1–2; (c) Machaquila Stela 7, C1; (d) Machaquila Stela 2, K3–4; (e) Buenavista del Cayo, Monument 14 (after Helmke et al. 2018:Fig. 6); (f) Copan Stela A, C10–D13 (after a drawing by Linda Schele); (g) Ek Balam Structure 8, Capstone 1 (after a drawing by Alfonso Lacadena); (h) Ek Balam Structure 1, Room 45, Capstone 14 (after a drawing by Alfonso Lacadena) (drawings by Nikolai Grube).

third person singular ergative pronoun. If this hieroglyph is correctly identified as an accession verb, the next hieroglyph in D3 should represent the name of the ruler. It consists of three signs, of which only the **wa** syllable can be read with some security. The name may extend until the next glyph block in C4, which is too destroyed for any further information.

In D4 is the so-called 'initial sign,' which functions as a focus marker and thus introduces the most important part of the text, in this case a Calendar Round date of 13 Akbal 6 Zec. Immediately after the Calendar Round is another Distance Number, this time in ascending order, but lacking the Uinal and Kin units. The two periods include 13 Tun and 7 Katun (C6–D6). The calendrical structure of the monument without doubt is intimately tied to the historical narrative. And yet, it is extremely difficult for us to connect the different chronological units. The Distance Number 1.?.?.?.10 does not connect the Calendar Round with the Initial Series date. Therefore, it seems that this Distance Number leads back into the past, probably from the Initial Series Date 9.3.13.0.0 back to a date before 8.3.13.0.0. The event associated with this early date (113 CE) would be the *ch'am K'awiil* accession statement. This early date is not too far from the founding of Naachtun as a city estimated by archaeology to circa 150 CE.

It makes a lot of sense to see the 'initial sign' (D4) as a separator between two text episodes. The Calendar Round date in C5 and D5 would then introduce the next passage, which is probably tied to the Initial Series by the Distance Number of 7 Katun and 13 Tun that follows. An argument in favor of this interpretation is the fact that the next glyph after the Distance Number is the same *mak* "enclosure" verb associated with the 9.3.13.0.0 date, albeit with a -**ya** suffix. The presence of the **ya** deictic suffix under the verb points to its function as a background marker, translating somehow as "it had been covered." This entire last part of the stela inscription could provide some information about previous events which had happened at approximately 8.16.0.0.0, long before the date of the erection of the stela, and which include a previous cache closing, repeated at the time the stela was erected.

This solution to the chronology and narrative would place the Calendar Round 13 Akbal 6 Zec at 8.13.3.13.3

(August 19, 301) or 8.15.16.8.3 (August 6, 353), relatively close to the 8.16.0.0.0 date reached by the 7 Katun and 13 Tun Distance Number, if it is indeed counted from the 9.3.13.0.0 dedication date. According to the rest of the inscription, on this day it had been closed (**ma-ka-ja-ya**, *ma[h]kaj[ii]y*) "his cache" (**u-WAY?-ya?**). Another verb appears in C8 with an unknown prefix but otherwise **BIX-ya,** *bix[ii]y*, "he went," suggesting that the hieroglyph in D8 is a toponym. The text ends with the statement **hu-li-ya** [**chi**]**CHA**, *huliiy chicha'*, "he had arrived in Chicha'" and thus refers to an important place in Maya history. The toponym *chicha'*, probably to be translated as "the place of the Maguey Grinder" (Stuart 2014) appears in inscriptions from many different Maya cities, such as at Palenque, Yaxchilan, Copan, Pusilja, El Resbalon, Dzibaanche, Calakmul, and Tikal (Grube 2004). The geographic frame of reference for this place name still remains very unclear. In almost all instances, the toponym occurs with early dates associated with the 8th Baktun. This time frame suggests that the toponym is linked to an important ancient city that must have played a significant role in early Maya history.

In summary, the information that can be gained from the analysis of the text on the front side of Stela C7 is that there was a cache-closing ritual at the time the stela was erected in 9.3.13.0.0. This ritual repeated an early cache closing in the 8th Baktun, possibly close to 8.16.0.0.0, which took place at the same time as a walking event and finally an arrival at the important Chicha', or maguey grinder place. The text also refers to an accession event, which seems to have taken place significantly earlier, and which could have been the inauguration of an early Naachtun ruler, perhaps the founder of the local dynasty.

Discussion

Interestingly, Stela 2, located in Group B and dated to 9.10.10.0.0, contains another long but incomplete distance number of 7?.11.#.7? which dates back to an unknown event situated in the first quarter of the fourth century (Garay 2019:116-117). Such an early date was interpreted as a reference to the founder of the local dynasty as a legitimating strategy for the Late Classic ruler depicted on Stela 2, after a possible usurpation of power (Nondédéo et al. 2018:345-346). It is possible to suggest that both early dates on Stela C7 and Stela 2 refer to the same event. In any case, they confirm that an important dynastic event took place at the beginning of the fourth century.

Another interesting point related to the text of Stela C7 is this mention of the toponym *chicha'*. It is unclear at this point if this mention "he had arrived in Chicha'" was mere political propaganda, similar to conceptions developed later by some rulers such as the Kanu'l kings (Tokovinine 2013:119-120), or if this indicates its existence as an actual city, possibly not too far from Naachtun. If so, El Mirador and Nakbe, two huge Preclassic centers located not too distant from Naachtun (15–20 km) would be good candidates to be the seat of Chicha'. Another detail worth mentioning is that the *huliiy* expression generally refers to historical events related to kings, a point which could establish the existence of this still unknown city. Furthermore, the mention on Altar 8 of a possible ancestor and founder of the local dynasty qualified as a *kaloomte'* could also allude to Chicha', as only Maya rulers from Chicha' could use this title in the fourth century (Martin 2020:80). Another possibility would be that here this title designated a foreign lord and/or a foreign founder, in this case probably linked with Teotihuacan, as Jatz'o'm Ku and Siyaj K'ahk are the only individuals known from early textual sources using this title (Nielsen and Helmke 2008; Nondédéo et al. 2023:20).

If we turn now to the archaeological data, the 2023 excavations carried out at the foot of C7 exposed the butt of the stela, in its original place and 1.17 m high, but no special deposit matching the one mentioned in the inscription has been found there (Figure 9), nor during the past but limited excavations made around Stela 24 or on top of the Triadic complex (Michelet 2016; Michelet and Zeceña 2016; Hiquet 2018). What we do know is the rather long sequence of occupation of this Triadic complex during the Early Classic period, from 250 CE until 600, when the occupation seems to have come to an end.

Occupation started underneath the triadic complex during Balam I sub-phase (150–300 CE) with the building of a small platform (Structure I-Sub) on top of a layer of black soil covering the bedrock. A vaulted burial chamber was dug into the bedrock in close proximity to this platform. It was dated by radiocarbon to between 206 and 377 CE (HPD region 95%), with a median at 291 CE. The triadic basal platform itself, topped by three temples, was built during the fourth century CE (Balam II sub-phase), covering Structure I-sub and the associated burial. A fourth structure was built on the north side on top of the Triadic basal platform. Its function was apparently to cover Stela 26, a monument dated by the style of its iconography to the second half of the fifth century (Nondédéo et al. 2018; Hiquet 2020:298, 324) and relocated, maybe a century after its dedication, in this secondary location. Unfortunately, this complex context was first reached by a looters' trench, which adds complexity to the reconstruction of the sequence of events. Associated with the stela was a deposit containing the remains of a child between two basal flange dishes. The looters exposed it, without removing it. It has been suggested that it is the original deposit, buried with the stela in its first location, but it must be noted that the two bowls appear slightly earlier (Balam II, fourth century CE) than the iconography of Stela 26.

Figure 9. Excavation of the butt of Stela C7 (photo by Benjamin Blaisot).

Also, a piece of charcoal from the niche where the deposit was found has been dated by radiocarbon to the interval 230–410 CE (95% probability). Another piece of charcoal from a fireplace interpreted as associated with this relocation event of Stela 26 was dated by radiocarbon from the interval 550–660 CE (95%) (Walker and Reese-Taylor 2012: 15).

All these activities over the Early Classic period mentioned on Stela C7, along with the important text present on Stela 24 dated from the final quarter of the fourth century, suggest the role and importance of the triadic complex in the dynastic affairs of Naachtun. However, none of our findings to date correspond to the repeated ritual and sealed deposits mentioned on Stela C7 from circa 350 to 507 CE.

Conclusion

Through these two examples, we can appreciate the contribution of photogrammetric technology to the documentation and reading of eroded Maya monuments. Even if some unclear sections of the texts remain poorly understood and consequently untranslated, the dataset gathered is extremely positive and this effort should be pursued before the complete loss of the last inscriptions due to erosion or destruction by vegetation or human action. The data gathered here, together with those recovered in 2022, date back to the first 'Bat' kings and the foundation of the city at the beginning of the Early Classic period. Even beyond the simple reconstruction of the dynastic history of Naachtun, these efforts to recover data have enabled significant advances in the understanding of early dynastic foundation in the Central Maya Lowlands. They mention the first occurrences in Maya inscriptions of the title of *kaloomte'* and offer another explicit example of the toponym Chicha' which, now with good reasons, seems to be related to an existing Preclassic and powerful city, perhaps located in northern Peten or southern Campeche.

Acknowledgements

The Naachtun Archaeological Project (2010–2026) has been funded by the French Ministry of Europe and Foreign Affairs, the CNRS, the Foundation Pacunam, the Perenco Company, the LabEx DynamiTe, and the Foundation Simone et Cino del Duca. It forms part of Cemca activities in Central America, and its fieldwork was undertaken with permission of the Instituto de Antropología e Historia (IDAEH) de Guatemala, and with the help of workers from Uaxactun.

References

Blaisot, Benjamin, Jorge Méndez, Nikolai Grube, Philippe Nondédéo, Julien Hiquet, Hemmamuthé Goudiaby, and Rémi Mereuze
2023 Operación III.5: estudios epigráficos/métodos de conservación y nuevas tecnologías para la documentación de las estelas 22, 36, 5 y C7. In *Proyecto Petén-Norte Naachtun 2023-2026: Informe de la Doceava Temporada de Campo 2023*, edited by Philippe Nondédéo, Johann Begel, and Julio Cotom-Nimatuj, pp. 227-272. CNRS-CEMCA. Presented to the Instituto de Antropología e Historia de Guatemala (IDAEH), Guatemala City.

Carrasco, Michael D., and Kerry Hull
2002 The Cosmogonic Symbolism of the Corbeled Vault in Maya Architecture. *Mexicon* 24(2):26-32.

Cases, Ignacio, and Alfonso Lacadena
2014a Operación III.5: estudios epigráficos, temporada 2013. In *Proyecto Petén-Norte Naachtun 2010-2014: Informe de La Cuarta Temporada de Campo 2013*, edited by Philippe Nondédéo, Carlos Morales-Aguilar, Julien Sion, Dominique Michelet, and Chloé Andrieu, pp. 375-404. CNRS-CEMCA. Presented to the Instituto de Antropología e Historia de Guatemala (IDAEH), Guatemala City.

Cases, Ignacio, and Alfonso Lacadena
2014b Operación III.5: estudios epigráficos, temporada 2014. In *Proyecto Petén-Norte Naachtun 2010-2014: Informe de La Quinta Temporada de Campo 2014*, edited by Philippe Nondédéo, Julien Hiquet, Dominique Michelet, Julien Sion, and Lilian Garrido, pp. 371-384. CNRS-CEMCA. Presented to the Instituto de Antropología e Historia de Guatemala (IDAEH), Guatemala City.

Cignoni, Paolo, Marco Callieri, Massimiliano Corsini, Matteo Dellepiane, Fabio Ganovelli, and Guido Ranzuglia
2008 MeshLab: an Open-Source Mesh Processing Tool. In *Eurographics Italian Chapter Conference (2008)*, edited by V. Scarano, R. De Chiara, and U. Err, pp. 129-136. Eurographics Association.

Colin, Mariana
2016 Operación VIa y VIb: Trabajos de conservación y restauración. In *Proyecto Petén-Norte Naachtun 2015-2018: Informe de La Sexta Temporada de Campo 2015*, edited by Philippe Nondédéo, Dominique Michelet, Julien Hiquet, and Lilian Garrido, pp. 555-573. CNRS-CEMCA. Presented to the Instituto de Antropología e Historia de Guatemala (IDAEH), Guatemala City.

Fash, William, Alexander Tokovinine, and Barbara Fash
2009 The House of New Fire at Teotihuacan and its Legacy in Mesoamerica. In *The art of Urbanism: How Mesoamerican Kingdoms Represented Themselves in Architecture and Imagery*, edited by William L. Fash and Leonardo Lopez Lujan, pp. 201-229. Dumbarton Oaks, Washington, D.C.

Garay Alejandro
2019 Operación III.5a: Estudios epigráficos, Temporada 2018. In *Proyecto Petén-Norte Naachtun 2015-2018: Informe de La Novena Temporada de Campo 2018*, edited by Philippe Nondédéo, Johann Begel, Dominique Michelet, and Lilian Garrido, pp. 115-133. Presented to the Instituto de Antropología e Historia de Guatemala (IDAEH), Guatemala City.

Grube, Nikolai
2004 El origen de la dinastía Kaan. In *Los cautivos de Dzibanché*, edited by Enrique Nalda, pp. 114-131. Instituto Nacional de Antropología e Historia, Mexico City.

2005 Toponyms, Emblem Glyphs, and the Political Geography of Southern Campeche. *Anthropological Notebooks* 11:87-100.
2008 Monumentos esculpidos: epigrafía e iconografía. In *Reconocimiento arqueológico en el sureste del estado de Campeche, México: 1996-2005*, edited by Ivan Sprajc, pp. 177-231. BAR International Series 1742. British Archaeological Reports, Oxford.
2010 Preposed Phonetic Complements in Maya Hieroglyphic Writing. In *Linguistics and Archaeology in the Americas*, edited by Eithne Carlin and Simon van de Kerke, pp. 27-43. Brill's Studies in the Indigenous Languages of the Americas, Vol. 2. Leiden and Boston.
2018 The Forms of Glyph X of the Lunar Series. *Textdatenbank und Wörterbuch des Klassischen Maya, Research Note* 9. https://bonndoc.ulb.uni-bonn.de/xmlui/handle/20.500.11811/1116

Helmke, Christophe, Joseph W. Ball, and Jennifer T. Taschek
2018 A Classic Maya Carved Capstone from Buenavista del Cayo, Belize. *Mexicon* 40(5):134-142.

Hiquet, Julien
2018 Operación II.1: Sondeos estratigráficos en los Grupos A y C. In *Proyecto Petén-Norte Naachtun 2015-2018: Informe de La Octava Temporada de Campo 2017*, edited by Philippe Nondédéo, Dominique Michelet, Johann Begel, and Lilian Garrido, pp. 29-122. Report presented presented to the Instituto de Antropología e Historia de Guatemala (IDAEH), Guatemala City.
2020 Essor monumental et dynamiques des populations, le cas de la cité maya de Naachtun (Guatemala) au Classique ancien (150-550 aprox. J.-C.). Doctoral thesis, Université de Paris 1 Panthéon-Sorbonne.
2022 Operación I.1: Análisis cerámico de la Temporada 2018. In *Proyecto Petén-Norte Naachtun 2019-2022: Informe de la oncena temporada de campo 2022*, edited by Philippe Nondédéo, Johann Begel y Lilian Garrido, pp. 15-33. Presented to the Instituto de Antropología e Historia de Guatemala (IDAEH), Guatemala City.

Kokalj, Žiga, and Maja Somrak
2019 Why Not a Single Image? Combining Visualizations to Facilitate Fieldwork and On-Screen Mapping. *Remote Sensing* 11(7):747.

Macri, Martha J., and Matthew G. Looper
2003 *The New Catalog of Maya Hieroglyphs. Volume 1: The Classic Period Inscriptions*. University of Oklahoma Press, Norman.

Martin, Simon
2005 Of Snakes and Bats: Shifting Identities at Calakmul. *The PARI Journal* 6(2):5-15.
2020 *Ancient Maya Politics: A Political Anthropology of the Classic Period, 150–900 CE*. Cambridge University Press, Cambridge.

Mathews, Peter, and Alexander Parmington
2005 Operación 6, Investigaciones Epigráficas. In *Proyecto arqueológico Naachtun: primera temporada de campo, febrero–abril de 2004*. Informe No. 1, edited by Rangel Martin and Kathryn Reese-Taylor, pp. 104-113. Presented to the Instituto de Antropología e Historia de Guatemala (IDAEH), Guatemala City.

Michelet, Dominique
2016 Operación V.1: El complejo Triádico. In *Proyecto Petén-Norte Naachtun 2015-2018: Informe de La Sexta Temporada de Campo 2015*, edited by Philippe Nondédéo, Dominique Michelet, Julien Hiquet, and Lilian Garrido, pp. 481-490. CNRS-CEMCA. Presented to the Instituto de Antropología e Historia de Guatemala (IDAEH), Guatemala City.

Michelet, Dominique, and Ingui Zeceña
2016 Operación V.1: El complejo Triádico. In *Proyecto Petén-Norte Naachtun 2015-2018: Informe de La Septima Temporada de Campo 2016*, edited by Philippe Nondédéo, Dominique Michelet, Julien Hiquet, and Lilian Garrido, pp. 435-453. CNRS-CEMCA. Presented to the Instituto de Antropología e Historia de Guatemala (IDAEH), Guatemala City.

Morley, Sylvanus G.
1937-1938 *The inscriptions of Peten*. 5 vols. Publication 437. Carnegie Institution of Washington, Washington, D.C.

Nielsen, Jesper, and Christophe Helmke
2008 Spearthrower Owl Hill: A Toponym at Atetelco, Teotihuacan. *Latin American Antiquity* 19(4):459-474.

Nondédéo, Philippe, Alfonso Lacadena, and Alejandro Garay
2018 Apuntes epigráficos: la temporada 2015 del Proyecto Naachtun. In *Tiempo detenido, tiempo suficiente. Ensayos y narraciones mesoamericanistas en homenaje a Alfonso Lacadena García-Gallo*, edited by Harri Kettunen, Verónica Amellali Vázquez López, Felix Kupprat, Cristina Vidal Lorenzo, Gaspar Muñóz Cosme, María Josefa Iglesias Ponce de León, pp. 329-350. Wayeb Publication 1. Wayeb, Couvin.

Nondédéo, Philippe, Alfonso Lacadena, and Juan Ignacio Cases
2019 Teotihuacanos y mayas en la 'Entrada' de 11 EB' (378 d.C.): nuevos datos de Naachtun, Peten, Guatemala. *Revista Española de Antropología Americana 49* (número especial):53-75.

Nondédéo, Philippe, Julien Sion, Alfonso Lacadena, Juan Ignacio Cases, Julien Hiquet
2021 From Nobles to Kings: The Political and Historical Context of Naachtun at the End of the Classic Period. In *Maya Kingship: Rupture or Transformation from Classic to Postclassic Times*, edited by T. Okoshi, A. Chase, P. Nondédéo, and M.-Ch. Arnauld, pp. 86-105. University Press of Florida, Gainesville.

Nondédéo, Philippe, Julien Hiquet, Hemmamuthé Goudiaby, Julie Patrois, and Nikolaï Grube
2023 Naachtun Altar 8: New Data from an Early Classic Monument. *Mexicon* 45(1):18-23.

Nondédéo, Philippe, Julien Hiquet, Rémi Mereuze, Hemmauthé Goudiaby, and Nikolaï Grube
2024 The Contribution of 3D Models to the Study of Stone Monuments in the Maya Area. *IdeAs* 24:189-205.

Patrois, Julie
2020 Operación III.Vb: Estudio iconográfico de los monumentos de Naachtun (temporada de campo 2019). In *Proyecto Petén-Norte Naachtun 2019-2022: Informe de La Décima Temporada de Campo 2019*, edited by Philippe Nondédéo, Johann Begel, and Lilian Garrido, pp. 115-140. CNRS-CEMCA. Presented to the Instituto de Antropología e Historia de Guatemala (IDAEH), Guatemala City.

Ruppert, Karl, and John H. Denison
1943 *Archaeological Reconnaissance in Campeche, Quintana Roo, and Peten*. Publication 543. Carnegie Institution of Washington, Washington, D.C.

Stuart, David
2014 A Possible Sign for Metate. *Maya Decipherment*: mayadecipherment.com/2014/02/04/a-possible-sign-for-metate/

Thompson, John Eric S.
1950 *Maya Hieroglyphic Writing: Introduction*. Publication 589. Carnegie Institution of Washington, Washington, D.C.
1962 *A Catalog of Maya Hieroglyphs*. University of Oklahoma Press, Norman.

Tokovinine, Alexander
2013 *Place and Identity in Classic Maya Narratives*. Dumbarton Oaks, Washington, D.C.

Vergne, Romain, Romain Pacanowski, Pascal Barla, Xavier Granier, and Christophe Schlick
2010 Radiance Scaling for Versatile Surface Enhancement. *Proceedings of the 2010 ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games*, ACM, pp. 143-150.

Walker, Debra S., and Kathryn Reese-Taylor
2012 Naachtun, Petén, Guatemala: First Analyses, Guatemala. Report submitted to FAMSI: www.famsi.org/reports/06035/06035Walker01.pdf