# Mayan Astronomy；Dresden Codex，page 24 （Part 2） <br> By Stan Cizek，January 8， 2020 

## Abstract

In＂Mayan Astronomy；Dresden Codex，page 24 （Part 1）＂，I suggested that there are unanswered questions regarding the Dresden Codex，page 24 interpretation．In this second installment，I am testing the thesis that the Tzolk＇in signs are part of a positional matrix，marking a position and not an exact date．

## Introduction

Questions：
－Are tables on page 24 of Dresden Codex designed to track indefinite movements of Venus only， or are they using Venus based orbital values as a unit of measure to track something else？
－Because this is a system based on a cyclical process，could it be that this system is supporting multiple units of a measure such as hours，days，years or degrees？
－Is the Tzolk＇in concept of exact dates association really the only explanation for the 260－day cycle？The highlighted tables in blue clearly display that rounding（truncation）is applied，thus a unique connection of the dates is no longer maintained and＂date＂could be substituted with a much broader definition as position marker．

Tzolkin＇in matrix：
Tzolk＇in can be also organized as a $20 \times 13$ matrix as show below：

| Symbol | Sequence | Name |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| （iv） | 1 | Imix | 1 | 8 | 2 | 9 | 3 | 10 | 4 | 11 | 5 | 12 | 6 | 13 | 7 |
| （8） | 2 | $1 \mathrm{k}^{\prime}$ | 2 | 9 | 3 | 10 | 4 | 11 | 5 | 12 | 6 | 13 | 7 | 1 | 8 |
| 圆 | 3 | Ak＇bal | 3 | 10 | 4 | 11 | 5 | 12 | 6 | 13 | 7 | 1 | 8 | 2 | 9 |
| I | 4 | K＇an | 4 | 11 | 5 | 12 | 6 | 13 | 7 | 1 | 8 | 2 | 9 | 3 | 10 |
| 遌 | 5 | Chikchan | 5 | 12 | 6 | 13 | 7 | 1 | 8 | 2 | 9 | 3 | 10 | 4 | 11 |
| F） | 6 | Kimi | 6 | 13 | 7 | 1 | 8 | 2 | 9 | 3 | 10 | 4 | 11 | 5 | 12 |
| （3） | 7 | Manik＇ | 7 | 1 | 8 | 2 | 9 | 3 | 10 | 4 | 11 | 5 | 12 | 6 | 13 |
| \％ | 8 | Lamat | 8 | 2 | 9 | 3 | 10 | 4 | 11 | 5 | 12 | 6 | 13 | 7 | 1 |
| 0 0 | 9 | Muluk | 9 | 3 | 10 | 4 | 11 | 5 | 12 | 6 | 13 | 7 | 1 | 8 | 2 |
| c | 10 | Ok | 10 | 4 | 11 | 5 | 12 | 6 | 13 | 7 | 1 | 8 | 2 | 9 | 3 |
| （0） | 11 | Chuwen | 11 | 5 | 12 | 6 | 13 | 7 | 1 | 8 | 2 | 9 | 3 | 10 | 4 |
|  | 12 | Eb | 12 | 6 | 13 | 7 | 1 | 8 | 2 | 9 | 3 | 10 | 4 | 11 | 5 |
| （1in） | 13 | Ben | 13 | 7 | 1 | 8 | 2 | 9 | 3 |  | 4 | 11 | 5 | 12 | 6 |
| （c） | 14 | Ix | 1 | 8 | 2 | 9 | 3 | 10 | 4 | 11 | 5 | 12 | 6 | 13 | 7 |
| （aili） | 15 | Men | 2 | 9 | 3 | 10 | 4 | 11 | 5 | 12 | 6 | 13 | 7 | 1 | 8 |
| 阿 | 16 | Kib | 3 | 10 | 4 | 11 | 5 | 12 | 6 | 13 | 7 | 1 | 8 | 2 | 9 |
| E1 | 17 | Kaban | 4 | 11 | 5 | 12 | 6 | 13 | 7 | 1 | 8 | 2 | 9 | 3 | 10 |
| （8） | 18 | Ets＇nab | 5 | 12 | 6 | 13 | 7 | 1 | 8 | 2 | 9 | 3 | 10 | 4 | 11 |
| 20： | 19 | Kawak | 6 | 13 | 7 | 1 | 8 | 2 | 9 | 3 | 10 | 4 | 11 | 5 | 12 |
| ［ | 20 | Ajaw | 7 | 1 | 8 | 2 | 9 | 3 | 10 | 4 | 11 | 5 | 12 | 6 | 13 |

The tables on the right side of the Dresden Codex，page 24 （in blue），refer only to the last row（Ahau in green）of this matrix and are not associated with any Haab specific dates．We can conclude that this type of association is referring primarily to a time span or period and not an exact date．


## Analysis

There are five tables R1 to R5 on this page highlighted in blue, where the Ahau rows are organized in two matrixes, one $2 \times 4$ elements and the second $3 \times 4$ elements.

This analysis will be limited to only three tables R1 to R3 of the 3x4 elements matrix.
Tables R4 - R5 Tzolk'in associated numerical value

| 1 | 1 | 1 | 1 |
| :--- | :--- | :--- | :--- |
| 1 | 1 | 1 | 1 |

Tables R1 - R3 Tzolk'in associated numerical values

| 6 | 11 | 3 | 8 |
| :---: | :---: | :---: | :---: |
| 13 | 5 | 10 | 2 |
| 7 | 12 | 4 | 9 |

Tables R1 - R3 associated numerical values

| 38,240 | 35,320 | 32,400 | 28,680 |
| :--- | :--- | :--- | :--- |
| 25,760 | 22,040 | 19,120 | 16,200 |
| 12,420 | 9,560 | 5,840 | 2,920 |

These tables can be read at least in two basic ways.

## Option 1

Tables R1 - R3

| 6 | 11 | 3 | 8 |
| :---: | :---: | :---: | :---: |
| 13 | 5 | 10 | 2 |
| 7 | 12 | 4 | 9 |

Tzolk' in matrix last row:


This line pattern indicates a continuous circular motion by numbers 7 and 13 positions. I selected the leftmost column as a starting point, just to visually demonstrate the continuous counter clockwise movement of the three groups of numbers as represented by the one-line Ahau row from the Tzolk'in $20 \times 13$ matrix. It is intriguing that the $3 \times 4$ matrix is visually read in clockwise direction.

Overall, in this option the distance between each consecutive number is 6 and each group of 3 in a column follows each other sequentially.

Let's apply the same motion concept to associated numerical values:
Tables R1 - R3 associated numerical values

| 38,240 | 35,320 | 32,400 | 28,680 |
| :--- | :--- | :--- | :--- |
| 25,760 | 22,040 | 19,120 | 16,200 |
| 12,420 | 9,560 | 5,840 | 2,920 |

Simple calculations between rows:

```
38,240-25,760=12,480
25,760-12,420=13,340
38,240-12,420=25,820
35,320-22,040=13,280
22,040-9,560 = 12,480
35,320-9,560=25,760
32,400-19,120=13,280
19,120-5,840=13,280
32,400-5,840=26,560
```

```
28,680-16,200=12,480
16,200-2,920=13,280
28,680-2,920=25,760
```

When reading the numbers in this fashion, an interesting pattern and concept emerge. These numbers could represent many object's cyclical patterns depending on the unit of measure involved. In this case, if the unit of measure is a year, one can't escape the conclusion that these numbers represent precession movement.

We can also intuitively conclude that we are looking into the precession of Equinoxes (movement of Equinoxes and Solstices along the Ecliptic), with the precession orbital value varied at each quadrant. However, it is not so simple to know without at least 4 quadrants of observations when based on an observation only.

## Option 2

Tables R1 - R3

| 6 | 11 | 3 | 8 |
| :---: | :---: | :---: | :---: |
| 13 | 5 | 10 | $\rightarrow 2$ |
| 7 | 12 | 4 | 9 |

Tzolk'in matrix last row:


Tables R1 - R3 associated numerical values

| 38,240 | 35,320 | 32,400 | 28,680 |
| :--- | :--- | :--- | :--- |
| 25,760 | 22,040 | 19,120 | 16,200 |
| 12,420 | 9,560 | 5,840 | 2,920 |

Simple calculations between columns starting at the right bottom corner:
2,920
$5,840-2,920=2,920$
$9,560-5,840=3,720$
$12,420-9,560=2,860$
$16,200-12,420=3,780$
$19,120-16,200=2,920$
$22,040-19,120=2,920$
$25,760-22,040=3,720$
$28,680-25,760=2,920$
$32,400-28,680=3,720$
$35,320-32,400=2,920$

## $38,240-35,320=2,920$

Three row ( $3 \times 4$ matrix) total: 12,420 $+13,340+12,480=38,240$
The complete cycle started at position 9 and ended at position 6 as shown on the last row of the Tzolk'in matrix. The next cycle would start at position 1. In this case the movement can be described as a group of four elements continuously moving together along the Ecliptic. Whatever is moving this way requires three rotations to cover 12 positions (Zodiac?) on an Ecliptic covering 38,240 years, before landing on position 1 to start a much larger cycle described in tables R4 and R5 of the Tzolk'in matrix. Because four fixed positions are indicated in this movement, it could logically be deduced that it also represents a movement of Equinoxes and Solstices over one quadrant of the Ecliptic in 38,240 years. In addition, it provides a distance in years between these four points over the period of $12,420,13,340$ and 12,480 years in this quadrant. Because the Ecliptic is not a perfect circle, the variable time in each position is reflecting reality.

The numbers can also be interpreted as a representation of the cumulative time period at each position, where each row is associated with a half of a precession cycle.

Twelve occurrences complete a cycle before a larger cycle starts at $13^{\text {th }}$ position.

## Observation conclusion:

Position and Quadrants are of a variable length.
Observations with such detail and without an instrumentation and computational power/knowledge over a long period of time substantially exceed the accepted length of the Mayan civilization period.

There is an error in the right bottom corner of Table R-1. Eight should be 9, and this indicates that a person who copied the text was not fully aware of the overall concept or meaning of this table and had no way to validate the correctness of the copy.

## Addendum:

Modern presentation of the same concept represented by the Tables R1 - R3.


By Cmglee - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=30359851
The coincidence of the annual cycles of the apses (closest and further approach to the sun) and calendar dates (with seasons noted) at four equally spaced stages of processionary 26,000-year-cycle. The season dates are those in the north. The tilt of Earth's axis and the eccentricity of its orbit are exaggerated. Approximate estimates. Effects of weak planetary precession on the stages shown are ignored.

