RESEARCH REPORTS ON ANCIENT MAYA WRITING

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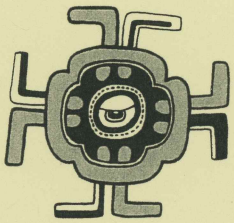
The Rise of Chak Ek'

Uguku Usdi
Alberto Saa
Christopher Wehunt

The In Lak'ech Study Group
Coalinga, California

BOUNDARY END ARCHAEOLOGY RESEARCH CENTER
(Formerly CENTER FOR MAYA RESEARCH)
BARNARDSVILLE · NC · USA
September 2013

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THE MISSION of the Boundary End Archaeology Research Center (BEARC) is to promote research in the archaeology and art history of ancient America with emphasis on Mesoamerican, particularly Maya, epigraphy and iconography; and to publish the results of such research.

This series, *Research Reports on Ancient Maya Writing* is, like other BEARC publications, peer-reviewed, and appears on an irregular schedule. Its subject matter focuses on Maya hieroglyphic writing and the calendar, and includes the presentation of new inscriptions and the revision of earlier drawings, as well as occasional works on the historiography of research related to these topics.

Up to now, the Center for Maya Research and the BEARC have operated on funds derived from paid subscriptions to print copies of this and the other journal, *Ancient America*. However, the costs of printing and postage have increased to the point that the production of paper copy is no longer feasible, except in special cases.

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George Stuart, Editor

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PREFACE

MAYA RESEARCH IN CALIFORNIA PRISONS

George Stuart

FOR MORE THAN A DECADE the Center for Maya Research and its successor, the Boundary End Archaeology Research Center, have taken part in a remarkable and productive relationship with a group of Native American inmates serving time in the Pleasant Valley State Prison in Coalinga, California, and other prisons in the state.

The story began in 2001, when Barry A. Bausman, also known by his Cherokee name, Uguku Usdi ("Little Owl"), and some fellow prisoners took an interest in the ancient Maya calendar and in astronomy. This came after they read Michael D. Coe's 1999 classic, "Breaking the Maya Code." Uguku Usdi was so captivated by this history of the decipherment of the Maya hieroglyphic script that he wrote a letter of inquiry to the people mentioned in the text or bibliography who were likely still alive. I responded, and thus began an exchange of letters and telephone calls that continues to this day. The correspondence file is now more than a foot thick, and growing.

Uguku Usdi and the study group he founded had begun work on the astronomical and calendrical content of the Maya codices with a total lack of source material. Thus, my first task was clear—to provide some basic references.

At the time I received Uguku Usdi's first letter (forwarded from National Geographic, shortly after my retirement), I was in the midst of sorting books—my own library of some 7,000 volumes along with about that same number from the library of the late Matthew W. Stirling, the gift of his widow, Marion Stirling Pugh.

As one might imagine, many duplicates came to light each day. These I set aside for the group. Hardback books, forbidden to go directly to prisoners, I shipped to prison chaplain Ricardo Duran, who placed them in his office library; paperbacks I sent (in packages conforming to strict limits of content and weight) directly to Uguku Usdi's cell block. Soon, the prisoners had access, not only to the best reproductions of the codices themselves, but also to complete sets of our own Center's special publications and serials—*Research Reports on Ancient Maya Writing* and *Ancient America*, along with papers by scholars, past and present, who had written on Maya astronomy and the calendar.

The letters that came back were both encouraging and, at times, somewhat discouraging. Uguku Usdi's vivid descriptions of the In Lak'ech Study Group (as they called themselves) sitting around in the yard of Cell Block 4 reading papers by John Teeple, Floyd Lounsbury, David Stuart, and others were wonderful. Nonetheless heartening were the stories of frequent "lockdowns," when the prisoners, confined to their cells, had to rely upon Maya hieroglyph flash cards held outside the bars for the response of others of the group who could see them!

Soon, the In Lak'ech Study Group began to produce papers. Eventually these reached more than a dozen in number. These I shared with colleagues who specialized in the topics involved, particularly Mayanist Bruce Love of Littlerock, California, and

Professor Anthony F. Aveni of Colgate University, Hamilton, New York. Both agreed that the paper presented here deserved publication. Thus, I offer it here as the final print issue of the *Research Reports on Ancient Maya Writing*, nearly 30 years after the appearance of Number One.

For co-authors Uguku Usdi, Alberto Saa, and Christopher Wehunt and their colleagues, this is an achievement of the first order, accomplished in the face of almost unimaginable odds. As is the case with all inmates, these men had neither e-mail nor access to the Internet. And if that were not enough, the continuing movement of prisoners among California's hideously overcrowded facilities now separates the members of the In Lak'ech Study Group. We are honored to publish this result of their determined efforts.

George Stuart
June 2013



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THE RISE OF CHAK EK'

Uguku Usdi

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The In Lak'ech Study Group
Coalinga, California

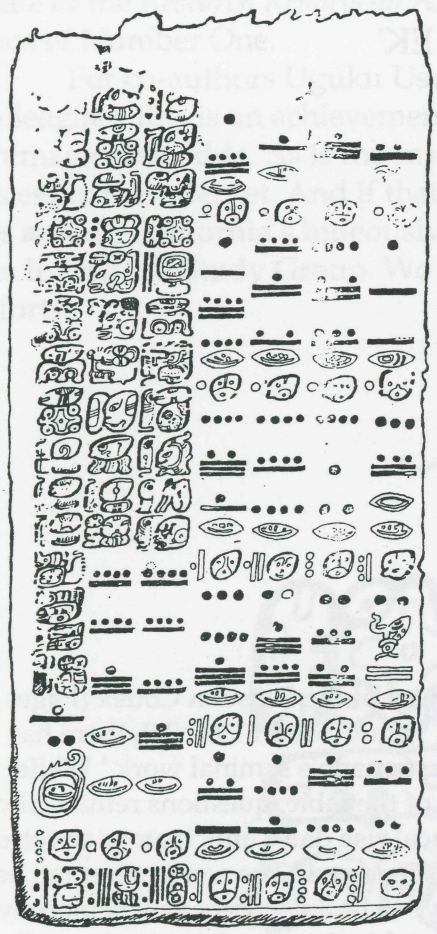
Since the 1880s, when Ernst Förstemann first identified part of the Dresden Codex (Pages 24 and 46-50) as a numerical table related to the planet Venus (Stuart 1992:24), there has hardly existed a Mayanist who hasn't tried refining Förstemann's seminal work.[1] While there has been almost universal agreement on some aspects of the table, questions remain about others. Two of the most prominent of these: 1) Are the heliacal rise dates anticipatory or retrospective?; and 2) When in "real time" would the table have been used? The work presented below attempts to address those two issues from what we believe to be an entirely new perspective.

It is pertinent here to briefly review the aspects of the table that are almost universally agreed upon. The entire table consists of six leaves or pages (Figure 1), with page 24 serving as the introductory section that outlined the Venus Revolutions (VRs) covered in the table proper and the corrections that were applied to keep the table in sync with the actual synodical cycle of Venus.[2] The corrections utilized were implemented after 33,280 days (57 VRs minus 8 days) or 35,620 days (61 VRs minus 4 days) and were developed in order to bring the table back into a better congruence with the Venus cycle on the date 1 Ajaw (Thompson 1972:63; Lounsbury 1978:781; Aveni 1980:189; Bricker and Bricker 2007:102), though when and in what order such corrections would have been implemented remains a point of contention.[3] Each of the remaining pages denoted a 584-day VR (repeated 13 times) that connected the heliacal rise of Venus as the Morning Star to one of five particular day signs of the Tzolk'in—K'an, Lamat, Eb, Kib, or Ajaw (Figure 1).

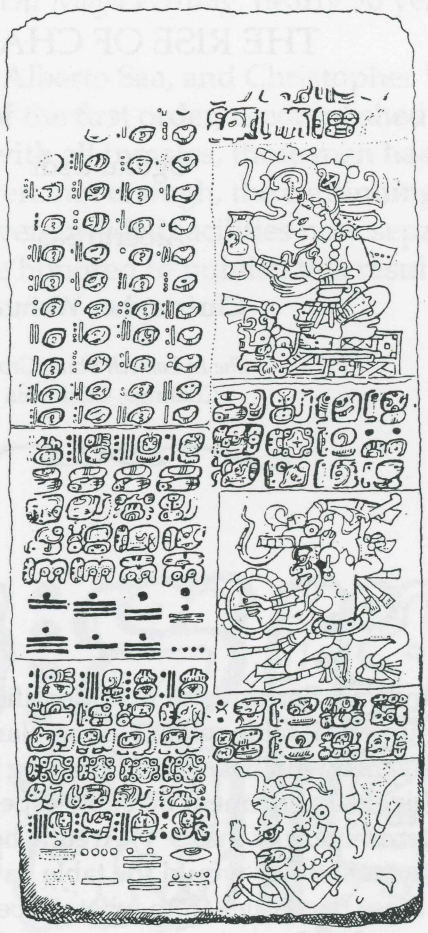
It has also been generally agreed that as the codex itself was created in the mid- to late-Postclassic Period (and was most likely an updated version of one in an earlier codex), the original base date of the table presented on Page 24, 9.9.9.16.0 1 Ajaw 18 K'ayab, would have most likely been obsolete by the time the Venus table in the Dresden Codex was created. Three other dates appear in the introductory section and the table proper: 1 Ajaw 18 Wo, 1 Ajaw 13 Mak, and 1 Ajaw 3 Xul. It is generally accepted that these dates represent additional "entry dates" for the table.

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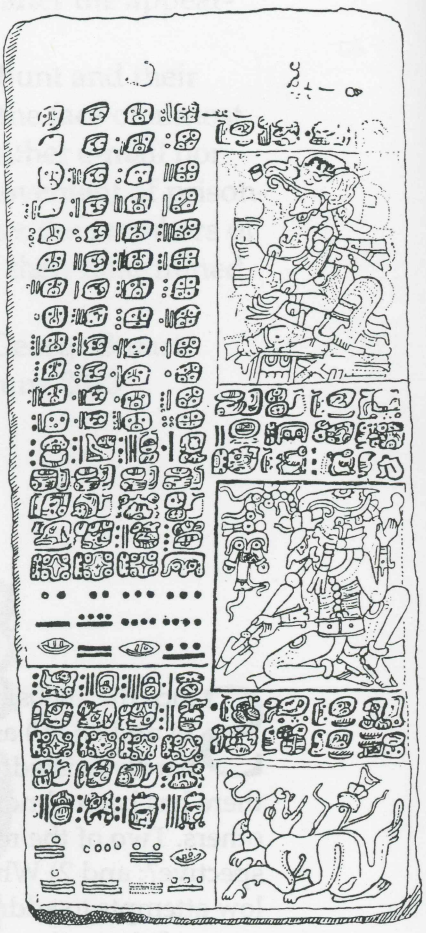
FIGURE 1. PAGES 24, 46, 47, 48, 49, AND 50 OF THE DRESDEN CODEX



PAGE 24



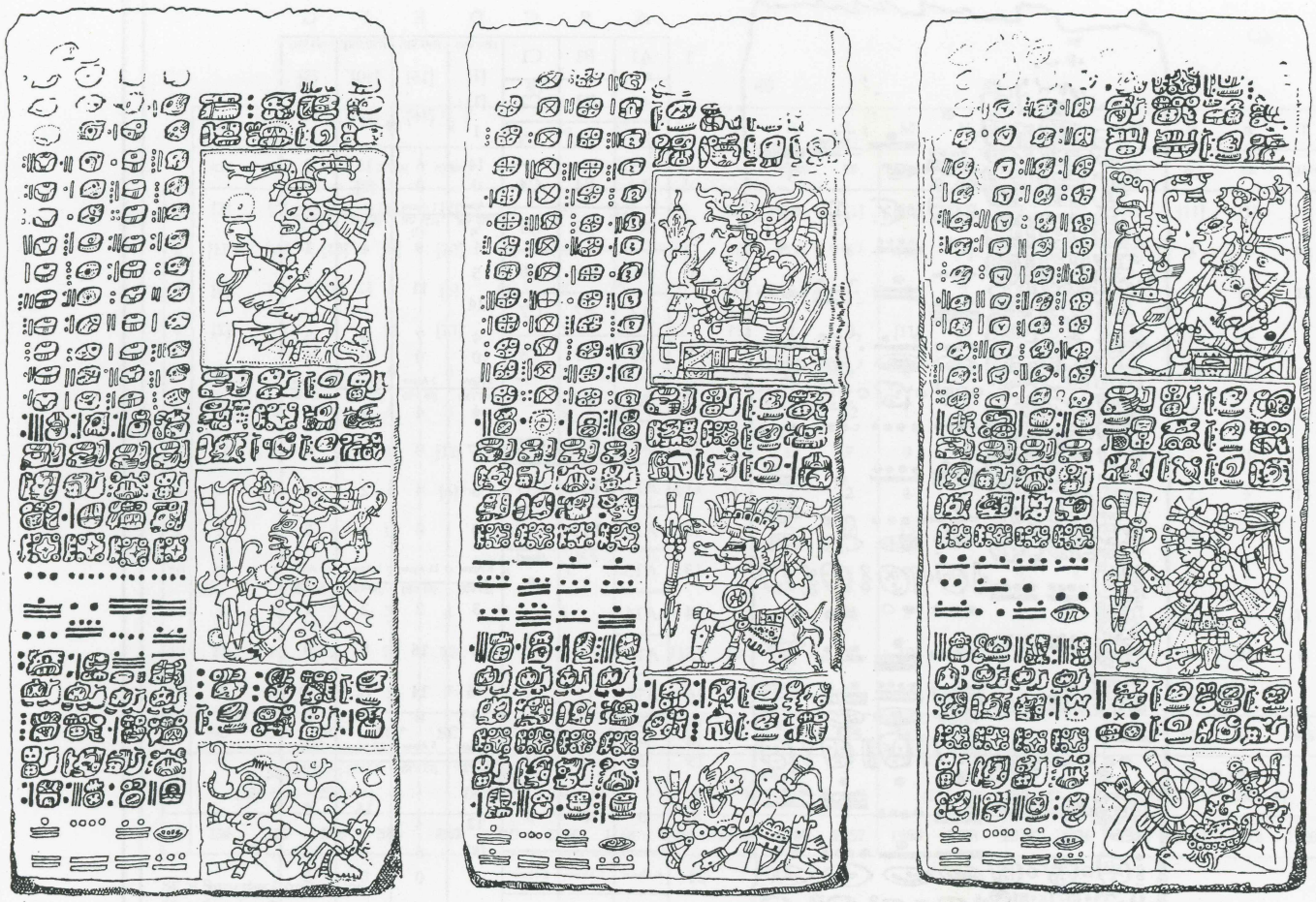
PAGE 46



PAGE 47

With so much agreement it would seem that one all-encompassing model of the Venus table could easily be presented, but such has not been the case. Over the decades, there have been several proposed models of the table, the most recent having been presented by Harvey M. Bricker and Victoria R. Bricker.[4]

Another interpretation that has gained general acceptance is that the structure and iconography of the Venus table implies that its creators were primarily concerned with Venus's heliacal rise as Morning Star (Aveni 1980:194; Aveni and Hotaling 1994:S23; Bricker and Bricker 2007:106-109). What remains elusive, however, is a definitive answer as to whether the dates given in the table for Venus's heliacal rise (and the auguries and/or rituals associated with those dates) were meant to anticipate the event (whereby it acted strictly as a warning table), or were they meant to be retrospective in nature (i.e., occur after the event had actually happened)? There has been ample argument for the anticipatory model (Gibbs 1977:34; Lounsbury 1978:789; Bricker and Bricker 2007:106-109, just to name a few), but we would offer that the table was neither strictly anticipatory nor strictly reflexive in nature, but, rather, acted as something akin to a canonical background against which the Maya astronomers could keep abreast of the ebb and flow of Venus's actual synodical cycle.



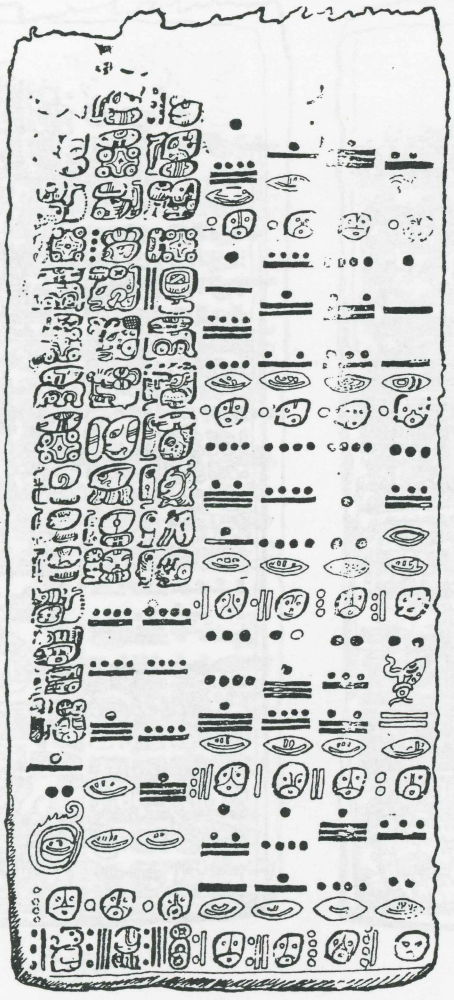
PAGE 48 PAGE 49 PAGE 50

AFTER VILLACORTA AND VILLACORTA 1992

Figure 2 presents a basic schematic of the Page 24 introductory section of the table, while Figure 3 presents a basic schematic of the day sign columns of the calendrical portions of Pages 46 through 50, with Page 46 being represented by columns A-D; Page 47, columns E-H; Page 48, columns I-L; Page 49, columns M-P; and Page 50 by columns Q-T. Line 14 of the Figure 3 schematic presents the Venus phase associated with each column (SC = Superior Conjunction, ES = Evening Star, IC = Inferior Conjunction, and MS = Morning Star). Line 15 denotes the 584-day VR represented by each page (or every four columns). Line 16 presents the number of days between each phase or station, and Line 17 presents the accumulative totals for each horizontal row of 5 VR (2,920 days).

It has long been known that the 584-day VR given in the table approximates Venus's 583.92-day average synodical cycle. What is lesser known, however, is that the actual length of a VR fluctuates in a cycle of five that is observable and for the most part predictable. The basic lengths of 5 actual VR, to the nearest whole day, are 580, 587, 583, 583, and 587 days - which, when averaged out, yields 584 days (Lounsbury 1978:777). While the basic lengths will themselves vary due to astronomical phenomena to as short as 579.6 days and as long as 588.1 days, any five consecutive VRs (for convenience, this cycle of five VRs will hereinafter be referred

FIGURE 2. SCHEMATIC DIAGRAM OF PAGE 24 OF THE DRESDEN CODEX VENUS TABLE



	A	B	C	D	E	F	G
1	A1	B1	C1	(260 VR) [1]	(195 VR) [15]	(130 VR) [10]	(65 VR) [5]
2	A2	B2	C2	[1]	[16]	[10]	[5]
3	A3	B3	C3	1 14	6	16	8
4	A4	B4	C4	0 1 Ajaw	0 1 Ajaw	[0] 1 Ajaw	0 1 Ajaw
5	A5	B5	C5	(317 VR -8) 1	(118 VR -12) 9	(57 VR -8) 4	(15 VR +340) 1
6	A6	B6	C6	5	11	12	5
7	A7	B7	C7	14			
8	A8	B8	C8	4 0 1 Ajaw	7 0 1 Ajaw	8 0 1 Ajaw	5 0 1 Ajaw
9	A9	B9	C9	(60 VR) 4	(55 VR) 4	(50 VR) 4	(45 VR) 3
10	A10	B10	C10	17	9	1	13
11	A11	B11	C11	6	4	2	0
12	A12	B12	C12	0	0	0	0
13	A13	(LR) 9	(Base) 9	6 Ajaw	11 Ajaw	3 Ajaw	8 Ajaw
14	A14			(40 VR) 3	(35 VR) 2	(30 VR) 2	(25 VR) 2
15	A15	9	9	4	16	8	0
16	A16	16	9	16	14	12	10
17	(RN)			0	0	0	0
18	6						
19	2	0	16	13 Ajaw (20 VR) 1	5 Ajaw (15 VR) 1	10 Ajaw (10 VR)	2 Ajaw (5 VR)
20	0	0	0	12 [8]	4 6	16 4	8 2
21	4 Ahaw	1 Ahaw	1 Ahaw	0	0	0	0
22	8 Kumk'u	18 K'ayab	18 Wo	7 Ajaw	12 Ajaw	4 Ajaw	9 Ajaw

to as a VRB, or Venus Revolution Bundle), will average out to 584 days (Aveni 1980:324, n. 12) when rounded to the nearest whole day. It is this fact that holds within it the real key to the Venus table.

While there has been much debate in regard to the puzzling discrepancies between the actual average lengths of Venus's phases and the length assigned to them by the creators of the Venus table, it is, as discussed above, generally accepted that the primary focus of the table was Venus's heliacal rise as Morning Star.[5] In light of our own findings, we would also propose that the focus was most specifically geared toward the heliacal risings associated with the day sign Ajaw. As can be seen in the Figure 3 schematic, on Line 15, the number of days between the beginning of each Morning Star phase given in the table is 584 days (236 + 90 + 250 + 8 = 584), with each horizontal row spanning five consecutive VRs, or one VRB. Because the VRB was known to modern and ancient astronomers alike (Aveni 1980:190), there seems little doubt that the Maya astronomers were well aware of it, and as such could use that knowledge to discern how many days the actual heliacal rise of Venus as the Morning Star would fall before or after the canonical date given for the event within the table.[6] For example, let us assume that we are a Maya astronomer using the table and that we are aware that the lengths of the VRs within the

FIGURE 3. SCHEMATIC DIAGRAM OF THE DAY SIGNS COLUMNS OF THE CALENDRICAL PORTIONS ON PAGES 46–50 OF THE DRESDEN CODEX

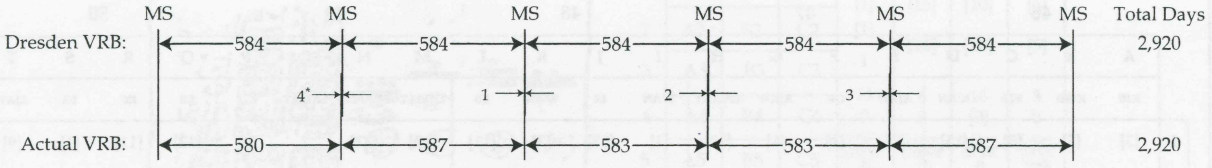
	46				47				48				49				50			
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
	KIB	KIMI	KIB	K'AN	AJAW	OK	AJAW	LAMAT	K'AN	IX	K'AN	EB	LAMAT	ETZ'NAB	LAMAT	KIB	EB	IK'	EB	AJAW
1	[3]	[2]	[5]	[13]	[2]	[1]	[4]	[12]	[1]	[13]	[3]	[11]	[13]	[12]	2	10	[12]	[11]	[1]	[9]
2	[11]	[10]	[13]	[8]	[10]	[9]	[12]	7	[9]	[8]	[11]	6	[8]	[7]	10	5	[7]	6	9	[4]
3	[6]	[5]	[8]	3	[5]	[4]	7	2	[4]	[3]	6	1	3	2	5	13	[2]	1	[4]	12
4	[1]	13	3	11	[13]	12	2	10	12	11	1	9	[11]	10	13	8	10	[9]	12	7
5	9	8	11	6	8	7	10	5	7	6	9	4	6	5	8	3	5	[4]	7	2
6	4	3	6	1	3	2	5	13	2	1	4	12	1	13	3	11	13	12	2	10
7	12	11	1	[9]	[11]	10	13	8	10	9	12	7	9	8	11	6	8	7	10	5
8	7	6	9	4	[6]	5	8	3	5	4	7	2	4	3	6	1	3	2	5	13
9	2	1	4	12	1	13	3	11	13	12	2	10	12	11	1	9	11	10	13	8
10	10	9	12	7	9	8	11	6	8	7	10	5	7	6	9	4	6	5	8	3
11	5	4	7	2	4	3	6	1	3	2	5	13	2	1	4	12	1	13	3	11
12	13	12	2	10	12	11	1	9	11	10	13	8	10	9	12	7	9	8	11	6
13	8	[7]	10	5	7	6	9	4	6	5	8	3	5	4	7	2	4	3	6	1
14	SC*	ES*	IC*	MS*	SC	ES	IC	MS	SC	ES	IC	MS	SC	ES	IC	MS	SC	ES	IC	MS
15 16	584 DAYS (236 + 90 + 250 + 8)				584 DAYS (236 + 90 + 250 + 8)				584 DAYS (236 + 90 + 250 + 8)				584 DAYS (236 + 90 + 250 + 8)				584 DAYS (236 + 90 + 250 + 8)			
17	236	326	576	584	820	910	1160	1168	1404	1494	1744	1752	1988	2078	2328	2336	2572	2662	2912	2920

*SC = Superior Conjunction
ES = Evening Star
IC = Inferior Conjunction
MS = Morning Star

VRB are currently (as given above) 580, 587, 583, 583, and 587 days. As the table gives a canonical value of 584 days for each VR, we would then know that the helical events in this particular VRB would fall four days before the first canonical date, one day before the second canonical date, two days before the third canonical date, three days before the fourth canonical date, and then fall exactly on the last canonical date. This ebb and flow can be visualized as illustrated in Figure 4.

A competent Maya astronomer, then, could use his knowledge of the actual VRB to coordinate the ceremonies or other activities called for on the canonical dates. He could also use such information to bolster his own reputation as an astronomer/priest. For example, let us say that sometime within the first VR of the VRB illustrated in Figure 4, the astronomer is approached by a high-ranking warrior who wishes to know when, by the Morning Star, would be an opportune time to mount an attack on an enemy. Let us further assume that the astronomer has been diligent in his observations and thus knows that the actual current VR will only be 580 days, or four days shorter than the canonical VR. Looking ahead to the next canonical date for Venus's rise as the Morning Star, which for the sake of argument, we'll say falls on the date 13 K'an, we'll also assume that the auguries for that date bode well. He could then say to the

FIGURE 4. CANONICAL DATES



* Difference between the actual number of days in a Venus Revolution Bundle and those found in the Dresden Codex.

warrior, "When Chak Ek' rises on Balun Ajaw [four days before the canonical date], it will be a sign that you should attack four days later, on Uxlajun K'an." Of course, Chak Ek' would indeed rise on 9 Ajaw, thus helping to secure the astronomer's reputation (assuming that the attack was successful!). This is, of course, only one example of how the Maya astronomers could have used their knowledge of the true VRB.[7]

It is important to note that the total number of days in each of the VRBs illustrated in Figure 4 total 2,920 days. This seems to be the true number of importance in the table,[8] for if any five consecutive VRs will, when rounded to the nearest whole day, average out to 584 days, the total number of days must fall on or very near 2,920.[9] What this means in terms of the astronomer using the table is that at the end of one VRB, regardless of the variations of the lengths of the VRs within it, the actual VRB and the canonical VRB would come together (or nearly together) on an Ajaw day representing the heliacal rise of Venus as the Morning Star, and would thus set the stage for the next VRB.

The question is, however, how does the hypothesis hold up to reality? Before that question can be answered we must address the issue upon which it is wholly dependent—the placement of the table in real time.

In their treatment of the Venus table as strictly a warning table, the Brickers argue that the table should start with a nontrivial negative error—that is, start on a date that precedes a heliacal rise event by a few days (Bricker and Bricker 2007:110). To effectively use the table as we have proposed has only two requirements: a diligent observation of the actual VRB, and a base date that coincides with a heliacal rise of Venus as the Morning Star from which successive VRBs can be calculated.

As mentioned above, aside from the original base date given on Page 24, 9.9.9.16.0 1 Ajaw 18 K'ayab, the dates 1 Ajaw 18 Wo (also found on Page 24, at C21-22 in the Figure 2 schematic), 1 Ajaw 13 Mak, and 1 Ajaw 3 Xul (both found within the table proper) are also presented, and it is generally accepted that these dates represent additional "entry dates" that correspond to new runs of the table after corrections have been implemented. Over the past decades several researchers have utilized the corrections first interpreted by Teeple (1926) from the so-called "aberrant numbers" that appear in the multiplication table on Page 24 (G2-D2 in the Figure 2 schematic), and the base and additional entry dates, to place the table into a historical context. Table 1 (See page 12) presents a synopsis of our own corrective scheme alongside those proposed by Thompson (1972:63), Lounsbury (1978:787), and the Brickers (2007:105).[10] As

can be seen, the previous corrective schemes have favored a repetition of the 1 Ajaw 18 K'ayab base date followed by additional entry dates. It will also be seen that from December 11, AD 1129 (Gregorian) on, the dates of our corrective scheme are the same as those proposed by Thompson and Lounsbury.

Because it is generally accepted that the 9.9.9.16.0 1 Ajaw 18 K'ayab original base date (which itself precedes by 15 days the nearest heliacal rise of Venus as the Morning Star) was obsolete by the time the Venus table was created,[11] we propose that the position granted to the date 1 Ajaw 18 Wo on Page 24 (at C21-22 in the Figure 2 schematic, immediately to the right of the original 1 Ajaw 18 K'ayab base date), and the fact that it specifically marks a heliacal rise of Venus as the Morning Star (see below), suggests that it was not merely an additional entry date, but an entirely new primary base date for the table. Support for this suggestion can be found in the four aberrant numbers of the multiplication table on Page 24 (G2-D2 in the Figure 2 schematic). From right to left the numbers are 1.5.5.0 (9,100 days), 4.12.8.0 (33,280 days), 9.11.7.0 (68,900 days), and 1.5.14.4.0 (185,120 days). To date, there seems to have never been a consensus regarding the use of or meaning behind the first number, 1.5.5.0.[12] The next two numbers, 4.12.8.0 and 9.11.7.0, have long been interpreted as the key numbers to the correction used in the table.

The last of the four aberrant numbers, 1.5.14.4.0, when added to the original 9.9.9.16.0 1 Ajaw 18 K'ayab base date, leads to the date 10.15.4.2.0 1 Ajaw 18 Wo, or December 11, AD 1129. In their recent work on the table, the Brickers state that there was nothing of astronomical note to talk about on 1 Ajaw 18 Wo in AD 1129 (2007:106). They support their statement by noting that their data concerning planet visibility was determined by using Hinkley (1989) and Swedlow and Lange (2002) software. They, however, do not discuss the parameters used to determine visibility or for what location their data was calculated. Using the planetary tables compiled by Bryant Tuckerman (1964), and calculating for the location of Chichén Itzá (Long. 88° 34' W, Lat. 20° 41' N) we were able to determine that when Venus was on the horizon (altitude 0), the *arcus visionis* of the planet was 5° 25' 33".91 (the sun being at altitude -5.421, or 5.421 degrees below the horizon), which is well within the Schoch limit for Venus's visibility.[13] Therefore, the date 10.15.4.2.0 1 Ajaw 18 Wo does indeed coincide with a heliacal rise of Venus as the Morning Star, and could thus act as a "zero date" from which actual VRs and VRBs could be calculated against the backdrop of the canonical dates.[14] The implementation of corrections would then yield entry dates consistent with those presented in the table proper: 1 Ajaw 13 Mak and 1 Ajaw 3 Xul.[15]

It should be noted that besides suggesting that it acted as a new primary base date, the position of the 1 Ajaw 18 Wo date on Page 24, rather than in the table proper, also suggests that the run of the table for which it had served as a base had already completed, or was close to completing, its run by the time the table was created, a correction implemented at the end of that run inaugurating the first of the two runs presented in the table proper. That first run of the table proper would have started on 11.0.3.1.0 1 Ajaw 13 Mak, or June 20, AD 1227; the second on 11.5.2.0.0 1 Ajaw 3 Xul, or December 28, AD 1324 (See Table 1).

Having now placed the table in real time, we can address the question as to how our hypothesis holds up to reality. Table 2 (See page 13) presents a summary of each of the VRBs in the historical runs of the table, which constitute rows 1-12 of each run.[16] As can be seen, in each run of the table the number of days in each VR in rows 2 to 12 never stray further than two days from those found in row 1 of the same run. Nor does the total number of days in the VRB stray more than one day from the 2,920-day total. Thus a diligent observer could use the knowledge of the actual VRB to keep a sort of running tally against the backdrop of the table's canonical dates, and never be off by more than a day or two in predicting the actual heliacal event.

Assuming for the moment that our hypothesis is deemed viable, if a Maya astronomer who makes careful observations will, by this method, never be off my more than a day or two

in his predictions, why would the corrections for the table be necessary? The simplest explanation is that while the astronomer could use the actual VRB for their predictions, for ritualistic purposes the ultimate goal would be for the actual heliacal events to occur as close as possible to the canonical dates (Gibbs 1977:35; Aveni 1980:187, 190-191), especially the all-important Ajaw dates. As can be seen in Table 2, after 60 VRs the difference between the actual VRBs and the canonical ones is 5 days, demanding a correction—a task that the Maya astronomers accomplished beautifully with the methods of correction they developed.

CONCLUSION

In this paper we have attempted to introduce the human factor, that is, the observational skills of the Maya astronomer, as a method of seeing the Dresden Codex Venus Table from a new perspective. In doing so we have demonstrated that the table itself need not be classified as strictly anticipatory or retrospective by presenting a model of the table that is able to accommodate both of those aspects (Anthony Aveni, personal communication 4/19/2010), and can thus be seen simply as the backdrop to the actual cycle of Venus, and against the canonical dates of which those actual cycles could be measured and predicted.

We have also been able to demonstrate the validity of the 10.15.4.2.0 1 Ajaw 18 Wo (December 11, AD 1129) date in regard to its connection to a heliacal rise of Venus as the Morning Star, and argue that it was not simply an additional entry date, but a completely new base date from which the actual VRs and VRBs could be tabulated. And, lastly, we have supported our hypothesis with data reflecting both the canonical and actual VRs and VRBs of the historical runs of the table.[17]

ACKNOWLEDGEMENTS

There is absolutely no way to overstate the roles George Stuart, Anthony Aveni, and Bruce Love have played both in our studies as a whole and in the present paper. For their help in making sure we had all the information we needed, guiding our way through the necessary astronomical formulas, being sounding boards for our ideas, and always being ready with words of encouragement, we will be forever grateful. An extra degree of our gratitude goes out to Dr. Aveni for his helpful comments on the earlier draft of this paper.

NOTES

1 This apparent interruption in the sequence is the result of two parts of the codex being torn apart then repaginated incorrectly.

2 Though Venus Cycle, Venus Synodical Period, or Venus Interval would be more correct, we have chosen to use the term Venus Revolution, or VR, as used by Thompson (1972:62) for convenience.

3 It must be kept in mind that these corrections are based in part on interpretations first made by Teeple (1926) in regard to the "aberrant numbers" presented on Page 24 (Aveni and Hotaling 1994:S51, n. 12).

4 Some classic works on the table include Teeple 1926, Thompson 1972, Closs 1977, Lounsbury 1978, and Aveni 1980.

5 The discrepancies can be summarized as follows:

	Duration of the Venus Phases (Days)	Actual Average Duration of Phases (Days)
Morning Star	236	236
Superior Conjunction	90	50–60
Evening Star	250	263
Inferior Conjunction	8	8

As can be seen, only the duration assigned by the creators of the Venus table to inferior conjunction approximates the actual average duration of a Venus phase that could be observed in the sky. While a number of hypotheses have been proposed for the discrepancies, their discussion is beyond the scope of the present paper.

6 We are certainly not the first to suggest that in the creation of the Venus table Maya astronomers may have faced a unique challenge of integrating their ritualistic needs and considerations with their observational astronomical knowledge (See Thompson 1972, Gibbs 1977, Lounsbury 1978, Aveni 1980, and Tedlock 1985).

7 It should be understood that the precision exhibited in the actual VRB of Figure 4 and the example of how a Maya astronomer may have used his or her knowledge of the VRB is used for illustrative purposes. Anthony Aveni (personal communication, 4/19/2010) reminds us that a plus-or-minus-two-day tolerance must be tacked on to all helical events, and we fully agree with him that, as such, a Maya astronomer might have been able to reckon the actual VRB presented in Figure 4 more along the lines of: shorter than average, longer than average, or average.

8 It has long been established that the multiplication table on Page 24 (Figure 2, G5-D3), presents all of the Ajaw dates of the table given in multiples of 2,920 days (five VRs).

9 With regard to whole days, the total can be as low as 2,918 days or as high as 2,922 days.

10 The format used here is after Bricker and Bricker (2007:105, Table 3.3).

11 Anthony Aveni (personal communication (04/19/2010) has convincingly argued that ritual considerations took precedence in choosing the 9.9.9.16.0 1 Ajaw 18 K'ayab base date as it was the closest date preceding a heliacal rise that is also commensurate with the Tzolk'in; the Haab; the number nine (the number of the Lords of the Night); and possibly the period of Mercury (117 days); the Venus period; the Calendar Round; and, of course, the Venus table itself.

12 Thompson amended the number to 1.6.0.0 (1972:63), Lounsbury remained somewhat ambiguous on the topic in his 1978 work (1978:784-786), but in 1992 offered a well-received solution for the number, while the Brickers (2007) do not address the issue at all. Closs (1977:97-98) offers the interesting suggestion that the 1.5.5.0 number, when added to the 9.9.9.16.0 1 Ajaw 18 K'ayab base date, leads to an astronomical base for Venus's first appearance as the Evening Star, but cautions that the base would be influenced by ritual considerations. Although ritual considerations were almost certainly at play with regard to the 1.5.5.0 number, we have found that utilizing it in just such a way does enable one to construct a useable, if rudimentary, table emphasizing Venus's first appearance as the Evening Star.

13 A star or planet's *arcus visionis* is defined by Schoch as "the depression of the Sun below the horizon, measured in the vertical circle for the moment when the star [or planet] sets on the last evening when it is visible or rises on the first morning when it is visible, refraction being discarded in the case of both bodies (Schoch 1924:731). Schoch (1924:733) gives a mean value of 5.2 to 5.8 *arcus visionis* for determining the visibility of Venus.

14 In the interest of fairness it should be noted that while we could argue (paraphrasing Aveni 2009:32) that what one sees in the sky looks surprisingly little like what is depicted in the desktop planetarium software that many use to infer what ancient astronomers saw, the use of standardized tables have their drawbacks as well, as they cannot completely account for all the small variations that can occur from natural (or even unnatural) phenomena. That being said, the *arcus visionis* of Venus on our proposed base date is so near the mid-point of the Schoch limit (5.5) that we feel it to be reasonably definitive.

15 Because from 10.15.4.2.0 1 Ajaw 18 Wo (December 11, AD 1129) on the dates of our corrective scheme are the same as those proposed by Thompson and Lounsbury, it seems fair to say that, in a fashion, their suggested base and entry dates could encompass our proposed model. We remain convinced, however, in the validity of our corrective scheme.

16 Though, as stated, the run of the table with the 1 Ajaw 18 Wo base date had likely been completed at or near the time of the creation of the table, it is included in Table 2 in the interest of continuity, and to present the count of VRBs from a Venusian "zero date."

17 The mathematical proofs, both in regard to the proposed 10.15.4.2.0 1 Ajaw 18 Wo (December 11, AD 1129) base date and the data presented in Table 2, are available upon request to the senior author, Uguku Usdi, through the Center for Maya Research.

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TABLE 1. HISTORICAL POSITIONS OF THE BASE AND ENTRY DATES OF THE DRESDEN CODEX VENUS TABLE

J. Eric S. Thompson (1972:63)	Floyd G. Lounsbury (1978:787)	Harvey M. & Victoria R. Bricker (2007:105)	In Lak'ech Group (Present Paper)
1 Ajaw 18 K'ayab 9.9.9.16.0 7 Feb. AD 623	1 Ajaw 18 K'ayab 9.9.9.16.0 7 Feb. AD 623	1 Ajaw 18 K'ayab 9.9.9.16.0 7 Feb. AD 623	1 Ajaw 18 K'ayab 9.9.9.16.0 7 Feb. AD 623
+ 1.6.0.0 = 16 VR + 16 days	+ 1.1.1.14.0 = 250 VR	+ 15.16.6.0 = 195 VR	+ 1.5.14.4.0 = 317 VR – 8 days
1 Ajaw 8 Sak 9.10.15.14.0 23 Sept. AD 648			
+ 19.15.14.0 = 244 VR – 16 days			
		1 Ajaw 18 K'ayab 10.5.6.4.0 23 Nov. AD 934	
		+ 4.12.8.0 = 57 VR – 8 days	
1 Ajaw 18 K'ayab 10.10.11.12.0 29 Oct. AD 1038	1 Ajaw 18 K'ayab 10.10.11.12.0 29 Oct. AD 1038	1 Ajaw 18 Wo 10.9.18.12.0 = 5 Jan. AD 1026	
+ 4.12.8.0 = 57 VR – 8 days	+ 4.12.8.0 = 57 VR – 8 days	+ 4.18.17.0 = 61 VR – 4 days	
1 Ajaw 18 Wo 10.15.4.2.0 11 Dec. AD 1129	1 Ajaw 18 Wo 10.15.4.2.0 11 Dec. AD 1129	1 Ajaw 13 Mak 10.14.17.11.0 16 July AD 1123	1 Ajaw 18 Wo 10.15.4.2.0 11 Dec. AD 1129
+ 4.18.17.0 = 61 VR – 4 days	+ 4.18.17.0 = 61 VR – 4 days	+ 4.18.17.0 = 61 VR – 4 days	+ 4.18.17.0 = 61 VR – 4 days
1 Ajaw 13 Mak 11.5.2.0.0 20 June AD 1227	1 Ajaw 13 Mak 11.5.2.0.0 20 June AD 1227	1 Ajaw 3 Xul 10.19.16.10.0 22 Jan. 1221	1 Ajaw 13 Mak 11.5.2.0.0 20 June AD 1227
+ 4.18.17.0 = 61 VR – 4 days	+ 4.18.17.0 = 61 VR – 4 days		+ 4.18.17.0 = 61 VR – 4 days
1 Ajaw 3 Xul 11.5.2.0.0 28 Dec. AD 1324	1 Ajaw 3 Xul 11.5.2.0.0 28 Dec. AD 1324		1 Ajaw 3 Xul 11.5.2.0.0 28 Dec. AD 1324

TABLE 2. LENGTHS OF ACTUAL VENUS INTERVALS OF THREE CONSECUTIVE RUNS OF THE DRESDEN CODEX VENUS TABLE

1 Ajaw 18 Wo Base Date Table

Rows of Table						Days	Totals	Diff.
R1:	584,	583,	583,	586,	584	2,920	2,920	0
R2:	584,	582,	583,	587,	584	2,920	5,840	0
R3:	584,	582,	583,	586,	584	2,919	8,759	+1
R4:	584,	583,	583,	587,	583	2,920	11,679	+1
R5:	584,	582,	583,	586,	584	2,919	14,598	+2
R6:	585,	582,	583,	586,	584	2,920	17,518	+2
R7:	584,	583,	582,	586,	584	2,919	20,437	+3
R8:	585,	581,	584,	586,	584	2,920	23,357	+3
R9:	585,	582,	583,	585,	584	2,919	26,276	+4
R10:	586,	582,	582,	586,	584	2,920	29,196	+4
R11:	585,	582,	583,	585,	584	2,919	32,115	+5
R12:	586,	582,	583,	585,	584	2,920	35,035	+5

1 Ajaw 13 Mak Entry Date Table

Rows of Table						Days	Totals	Diff.
R1:	582,	582,	585,	584,	586	2,919	2,919	+1
R2:	582,	583,	585,	584,	586	2,920	5,839	+1
R3:	582,	583,	584,	584,	587	2,920	8,759	+1
R4:	583,	582,	585,	587,	583	2,920	11,679	+1
R5:	584,	582,	583,	584,	586	2,920	14,599	+1
R6:	582,	583,	584,	584,	586	2,919	17,518	+2
R7:	583,	583,	583,	584,	587	2,920	20,438	+2
R8:	582,	583,	584,	584,	586	2,919	23,357	+3
R9:	583,	583,	583,	584,	587	2,920	26,277	+3
R10:	582,	583,	584,	584,	587	2,919	29,196	+4
R11:	582,	583,	584,	583,	587	2,919	32,115	+5
R12:	583,	583,	583,	584,	587	2,920	35,035	+5

CONTINUED ON NEXT PAGE

TABLE 2. CONTINUED

1 Ajaw 3 Xul Entry Date Table

Rows of Table						Days	Totals	Diff.
R1:	583,	583,	583,	587,	583	2,919	2,919	+1
R2:	584,	582,	584,	587,	583	2,920	5,839	+1
R3:	583,	583,	584,	586,	584	2,920	8,759	+1
R4:	583,	583,	583,	587,	583	2,919	11,678	+2
R5:	584,	582,	584,	586,	584	2,920	14,598	+2
R6:	583,	583,	583,	587,	583	2,919	17,517	+3
R7:	584,	584,	582,	587,	584	2,921	20,438	+2
R8:	584,	582,	583,	587,	583	2,919	23,357	+3
R9:	585,	582,	583,	586,	584	2,920	26,277	+3
R10:	584,	583,	582,	586,	584	2,919	29,196	+4
R11:	584,	582,	583,	586,	584	2,919	32,115	+5
R12:	585,	582,	583,	586,	584	2,920	35,035	+5

EDITOR'S NOTE

THIS ISSUE of the *Research Reports on Ancient Maya Writing* brings us to the end of almost three decades of issuing the series in print form—a grand total of some 1,000 pages of epigraphic analysis that we hope has helped, not only in the ongoing decipherment of the Maya script, but also by providing useful insights into the ancient culture that used it.

With this number again comes my profound gratitude to, and appreciation of, the authors and the hundreds of extraordinarily patient subscribers who never once complained, despite the all-too-frequent delays in publication.

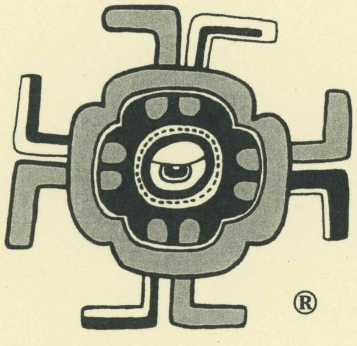
My thanks extends to those who helped in the demanding production of the series, especially Jeffrey Splitstoser of Silver Spring, Maryland. Essential help came from many others as well—local designers Ed Smith and Helen Robinson; and printers Doug Keen and the late Mike Evans. We are especially indebted to the scholars of the Maya who took time to review manuscripts submitted for publication.

This series continues on the Internet under the auspices of the Mesoamerica Center at the University of Texas, Austin. So far, three of those, Numbers 61, 62 and 63, may be downloaded from the Texas Digital Repository through links on the UT center's web site (utmesoamerica.org) or David Stuart's blog site (decipherment.wordpress.com).

The print versions of Numbers 1 through 60 that are still available—and that includes all but a few—may be ordered from our own web site precolumbia.com/bearc. There, out-of-print issues may be downloaded free, while prices for issues in print are listed. There, payment may be made with credit cards via PayPal, or by contacting me directly by e-mail at maya84@mac.com.

Once more I thank you, and hope you will continue to use and enjoy the series.

George Stuart



Design and layout by Jeffrey Splitstoser and George Stuart,
Boundary End Archaeology, Barnardsville, North Carolina.