Living the Lunar Calendar

Edited by
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Foreword

In the winter of 2010, during the full moon of the Hebrew month of Shevat (*Tu Bishvat*), the Jewish New Year for Trees, the Bible Lands Museum Jerusalem proudly hosted the "Living the Lunar Calendar" conference. The conference brought together scholars from around the world to discuss a wide range of issues relating to the tracking of time, and the calendar in diverse cultures, ancient and modern, ranging from those of the Ancient Near East and Biblical Israel, Qumran and early Christianity, and broadening our scope at the Museum to include classical and medieval Europe, the native peoples of the Americas, and China and Japan. Conference participants, including speakers, and members of the Bible Lands Museum Jerusalem community, had the opportunity to share a common experience of discovery, both on site at the Museum and on a visit to the Dead Sea and the archaeological site at Qumran. Over the three days of the meeting our participants, experts and laymen alike, examined familiar and unfamiliar civilizations and text-traditions that all shared the common human experience of marking the passage of time by means of the universe around us, in particular the movements of the Moon, the Sun, and the Stars.

The Bible Lands Museum is a universal centre for people of all faiths dedicated to the study, understanding and appreciation of the cultures of the Ancient Near East. As Israel's largest museum dedicated solely to the ancient history of this region, the Museum reflects the rich city within which it exists: Jerusalem today remains deeply influenced by the lunar cycles of the Jewish, Islamic, and Christian liturgical calendars. Dictating the ebb and flow of our calendar year and the intertwining of religious celebrations and worship, the Museum is a natural home for this type of program, given its ongoing commitment to academic excellence, and to facilitating public participation in high level educational programming. It is in answer to both these goals that we at the Bible Lands Museum Jerusalem are pleased to be able to once again share in the "Living the Lunar Calendar" experience, this time through the written pages of this volume.

I would like to express my gratitude to the many outstanding participants in this conference and publication, and in particular to our partners in coordinating and organizing the conference, Prof. Jonathan Ben-Dov of Haifa University, Prof. Wayne Horowitz and Prof. Shalom Paul of the Hebrew University of Jerusalem, Prof. John Steele of Brown University and Bible Lands Museum Jerusalem Curator, Dr. Filip Vukosavović.

We are deeply indebted to the many supporters who made this conference possible, including Mr. Henry Zemel of the Caeno Foundation, without whose initial enthusiasm this entire conference may not have been organized. In addition we would also like to thank The Bible Department at the University of Haifa, The Orion Center for the Study of the Dead Sea Scrolls and Associated Literature at the Hebrew University of Jerusalem, Qumran National Park, Israel Nature and Parks Authority and The Haifa Forum for the History of Science for their support and assistance.

In closing, I would like to thank Carolyn Budow Ben-David and the staff of the Bible Lands Museum Jerusalem for all of the hard work that ensured a most successful conference from start to finish, and to John Steele for helping to preserve the research and knowledge that is shared in this publication for future study and greater understanding in this fascinating and timeless field.

Amanda Weiss
Director
Bible Lands Museum Jerusalem

Introduction

The opening scene of Aristophanes' *Clouds* famously shows how the protagonist, Strepsiades, fears the nearing arrival of the new moon, because on that day he would need to pay his debts. But Strepsiades is also well aware that the declaration of the new moon in Greek cities could be announced either *kata selene*—i.e. according to the actual sighting of the moon—or *kata archon*, i.e. according to the present needs of the ruler. For example, while a declaration of an intercalary month could be expected on astronomical grounds, a given ruler could choose to postpone the extra month if he needed the new year's tax payments urgently. Another anecdote related to the new moon is found in the Babylonian Talmud: the Jewish sage R. Ḥiyya, upon viewing the new moon, throws clods of earth at it because it destroys the pre-calculated scheme assigned to it by the rabbinic court (b.Rosh Hashana 25:1, cf. the Palestinian parallel story in y.Rosh Hashana 12:2, which mentions pebbles of stone instead of clods of earth, due to the different geology of the region).

These anecdotes from classical Greek comedy and rabbinic literature illustrate the main themes of the present volume. Calendars have often been subject to a qualitative study, surveying administrative texts as well as scientific treatises and ritual prescriptions, in order to ascertain the calendar or calendars practiced under the respective society, and more work remains to be done in understanding the technicalities of historical calendars (some examples are included in the present collection). But the articles collected here represent not only the mathematical dimension of calendar reckoning—they also consider the effect of the great forces of ancient history on the calendar: politics, identity, social cohesiveness, cultural hybridity, and ultimately the basic questions of human civilization, namely how does mankind enforce order on the endless flow of natural phenomena. Time is one of the most basic categories—if not the most basic one—in the rational matrix by which human beings create meaning in the world. This was acknowledged on the philosophical level by Immanuel Kant, Henri Bergson and Martin Heidegger, to name only a few. It has been applied to the study of historical and contemporary calendars by M. P. Nilsson in his groundbreaking *Primitive Time-Reckoning* (1920) and by E. Zerubavel in his *The Seven Day Circle* (1985). Some recent prominent studies which have integrated the study of the calendar into the fabric of culture and society include Jürgen Rüpke's *Kalender und Öffentlichkeit* (1995), Sylvie Anne Goldberg's *La Clepsydre* (2000), and Anthony Aveni's *Empires of Time* (1989). The papers in this volume too consider questions of how calendars and the management of time are embedded within the political, social, religious and other aspects of historical cultures, based upon careful study of primary source material.

Scientific Indeterminacy and Political Intervention

The most profound conflict of the lunar calendar is its indeterminacy, which comes to the fore both in the irregular length of months—29 or 30 days—and in the periodic need to intercalate the year, inserting an additional month in order to align the year with the march of the seasons. While the latter problem can be managed through the use of cycles of intercalations (for example the 19-year Metonic cycle), accurate calculation of whether the new moon will be visible on a given day is not possible. A variety of factors such as weather conditions and the acuity of the eye of the observer hamper the modeling of the moon's visibility even today. Human societies have thus needed to address these indeterminate situations: When should commodities for the festival be arranged if it might be postponed in the last minute? How are taxes and interest to be calculated along an indeterminate number of days? The article by Patrizia Marzillo addresses a related problem in the form of the Greek 'Old and New Day', a term which appears both in Aristophanes' *Clouds* and in the Archaic piece *Works and Days* by Hesiod. This ambiguous marker of time raised much speculation in post-classical times, when calendar reckoning stabilized under the later Roman Empire. Marzillo discusses the allegorical meaning attached to this term in scholia from Late Antiquity. Using Pythagorean number manipulation and other cultural templates connected with the moon and the sun, the Neo-Platonist philosopher Proclus highlighted the idea of rest connoted with the day of conjunction.

The indeterminacy of the calendar creates conspicuous lacunae in the routine conduct of society. These lacunae, in turn, call for an intensive involvement of political institutions and other organs of power, who stand in the breach by undertaking the duty—and the privilege—to make effective calendrical decisions. In some cultures time reckoning was associated so closely with kingship that it functioned not only at the level of ritual (the New Moon, the New Year), but also on the level of myth, anchoring the regulation of time in the metaphysical image of kingship. The article by John Steele traces such a phenomenon in Chinese tradition—the emperor's role in maintaining cosmic harmony and possessing the mandate of heaven—and compares it with the apparently more mundane administrative and cultic reasons for the regulation of the calendar in Mesopotamia.

It is curious to note that the question of authority over the calendar arose not only in societies which practiced *ad hoc* observations, but also in China and Mesopotamia where calendars based on calculations were in use. The Jewish tradition is a prominent example of a culture that gave a central role to political considerations in the calendrical procedure. Since this cultural tradition transmits more information on the policy of calendar-making than any other ancient tradition, it is discussed in the present volume quite extensively. Sacha Stern dedicates his article to the political context of the procedure for observing the new moon, as described in the Mishnah and later rabbinic sources. Stern stresses the character of this procedure as a judicial, even forensic, mode of activity. In his opinion, the judicial flavour derives from the procedures of the *boule*, the city council in Palestinian cities during the Roman period. Unlike earlier authors, Stern does not see the civil authority of the rabbinic court as an established fact, but rather submits that the rabbis had to compete with other organs of power. Hence the judicial character of the rabbinic procedure, which was aimed to compete with the force of the city council, otherwise the most natural regulator of the calendar. Stern assigns little place to the role of ideological factors in the calendrical realm.

Robert Hannah discusses the importance of the calendar in another aspect of national identity: the organization of the ancient Greek Olympic Games which brought together people from across the Greek city states. In an attempt to reconstruct when the games were held—and, crucially, how people in different parts of the Greek world knew when the games were to take place—Hannah discusses the conflicting testimonies found in a handful of scholia which must be correlated with the most obvious time constraint: the games must be held at a season in which fresh olive leaves are available for making the victors' wreaths! Hannah suggests a novel solution, which should be taken in account by ancient historians who study this emblematic expression of pan-Hellenism.

Schematic vs. Observational Rulings

During a relatively short interval in the Jewish tradition, a schematic calendar of 364 days was practiced by apocalyptic circles in Hellenistic Palestine. The most famous attestation of this calendar appears in the Dead Sea Scrolls from Qumran, and in the earlier books of 1 Enoch and Jubilees. This tradition arose out of priestly circles that promulgated the generative role of the week and other heptad time units in the construction of the calendar. This tendency more or less disappeared with the destruction of the Jerusalem Temple in 70 CE, with more mainstream Jewish traditions left to find their way between the solar Julian calendar of the empire and the more well-rooted luni-solar tradition of the Levant. Jonathan Ben-Dov discusses how the 364-day calendrical tradition in the Dead Sea Scrolls interacts with the luni-solar calendar. This is done on the basis of comparison with some Ptolemaic Egyptian texts, which were similarly required to synchronize their schematic (365-day) year with the (Macedonian) lunar calendar. The result is that, while the role of the moon is not altogether ignored in the Qumran texts, it is diminished with regard to the 364-day framework. Here, the role of the Moon is less pronounced than in the Egyptian synchronistic calendars. The reason for this must be ideological on the part of the sectarian authors.

Ron Feldman gives a different view of the distinction between the luni-solar and the 364-day calendars in the early Jewish tradition. Using a method from cultural studies he distinguishes frameworks of Wild Time from those of Tame Time, and assigns the different Jewish perspectives to these distinctive concepts. To him, the various Jewish positions are an outcome of varying ideological attitudes to the encounter between mankind and nature. Finally, Lawrence Schiffman supplies a comprehensive survey of the contradicting trends—observation and calculation—in Israelite and Jewish calendars, from the Hebrew Bible to the Middle Ages.

Every historical text which aims to predict astronomical phenomena must depend on a scheme of some sort. The paper by Michael Gorodetsky sheds light on a fascinating period in history in which the schemes available to astronomers were not particularly accurate, but in which the genealogy of astronomical schemes is more valuable than their actual content. As part of his survey of medieval Russian manuscripts, Gorodetsky studies the Russian tables of Kirillo-Belozersky, which record computed lunar phases and eclipses for a period of 19 years in the 14th century. Submitting these tables to a thorough statistical analysis using modern ephemerides, Gorodetsky is able to trace the origins of the tables to the city of Belgrade, thus shedding welcome light on the otherwise unknown discipline of astronomy in this part of the southern Slavic region in the late Middle Ages.

Tradition and the 'Other'

Calendars are in many ways the 'applied science' branch of astronomy, with this feature of the calendar naturally being more pronounced in calculation-based systems rather than in those based upon observation. Thus, an intercalation method usually reflects the achievements of astronomical science at the time of its inception. What should be done, however, when the underlying system is out of sync with the real passage of the seasons, due to solar and lunar anomalies and other elements that had not been considered at the time of the institution of the system? This is a significant challenge for traditional societies because calendrical schemes tend to acquire more prestige than the mere instruments of calculation that they are. Associated with prominent kings and patriarchs, they also serve as the basis for a whole set of civil and ritual statutes that are not easily amended. The range of sources discussed in Schiffman's article ends before this problem arose with the traditional Jewish calendar, as it is presently encountered. Contemporary Jewish authorities fail to face the upcoming crisis, which has already led to the occasional celebration of Passover on a later date than is theoretically permitted. The substantial article by Susan Tsumura gives some food for thought in this matter, as it describes the gradual recognition of the same problem in China and Japan in the 15th – 16th centuries CE. Not only was the Metonic cycle discarded in favour of more accurate systems, the whole set of rituals dependent upon it had to be gradually revised, to the dismay of calendar traditionalists. Tsumura draws a long history of compromises reached in the Chinese and Japanese states, including the current one which will lead to a calendrical crisis in Japan in 2033, and thus requires urgent action on the part of the authorities. In terms of social history this challenge is interesting because, now at the dawn of the 21st century, the functioning organs of traditional societies no longer retain their original modes of operation. The ever-turning wheel of history impacts on many areas of human experience; the calendar is one realm where this transition is easily detected and pointed out to the public, while on the other hand the regulation of the calendar has far-reaching implications for the most basic aspects of human existence.

The adoption of the Julian year—and its later Gregorian modification—by Christian authorities made life relatively easy for Christians in modern history. However, the solidification of Christianity's foundational calendars and rituals was not at all smooth. This long stabilization process of Christian identity was part of what is commonly called 'the Parting of the Ways' with Judaism. Once again we encounter how historical topics, hotly debated by theologians and philologists, can be more easily tracked by their ramifications in the realm of the calendar. The most notorious problem of early Christianity in this regard was the mode of fixing the date of Easter. Christians were not satisfied with fixing this festival according to the Jewish date of the Passover, and instead sought ways to fix the date of Easter by means of an independent Christian method. This debate produced many conflicting mechanisms, and lead to enormous advances in theory and practice. A glimpse into the materialization of this problem is supplied here by the article by Mark Dickens and Nicholas Sims-Williams (with contributions by T. A. Carlson and C. Reck). This article supplies a publication and commentary of a dozen or so previously unpublished Christian calendrical fragments from the environs of Turfan in North West China from the 9th to the 12th centuries. Written in Syriac and Sogdian (some are Sogdian in Syriac script), these fragments reflect the vicissitudes of the calendar in this distant branch of the Eastern Christian oikoumene. The church in this region preoccupied itself—like many other Christian institutions elsewhere—with the timing of Lent and Easter. The special point in these texts is the synchronization of three different calendar systems—Syrian, Sogdian, and the Chinese 12-year animal cycle – each using different sets of month names.

The Easter computus in another corner of the Christian world appears in the essay by Daniel Mc Carthy. Continuing his earlier work on Anatolius' *De ratione paschali*, Mc Carthy examines the principles adopted in this 4th century CE treatise in order to harmonize the Julian calendar with the luni-solar Jewish year. Having been preserved in Latin translation and spread mainly in the West, this book preserves a curious list of the Hebrew month names and provides an easily rhymed rule-of-thumb for the calculation of the day in the lunar month equivalent to a given Julian date. This rhyme is found both in Old Irish and in a Bergamesque language from the Italian Alps. All this attests to an extraordinary acceptance of Anatolius' principles in the Latin West during the early Middle Ages, no doubt due to their elegance and usefulness.

As it turns out, Christian authors maintained ambiguous relations with the Jewish calendar. In fact, in most cases the debates and agreements were held not against the *true* Jewish calendar—either the contemporary one or the one practiced by Jews at the time of the Crucifixion—but rather with *imagined* Jewish calendars. The complexity of the Jewish-Christian debate thus becomes manifest in calendrical writings. Here, Christian literati mediate the alien Jewish customs to their fellow Christians, while making use of, sometimes even manipulating, the inherent tension between the present-day Jews, the biblical Hebrews, and the Jews from the time of Christ. Philip Nothaft discusses several occasions in which medieval Christians made recourse to the Jewish Calendar, whether a real or imagined one. Paul of Burgos, a 14th century rabbi converted to a Bishop, constitutes the pinnacle of this game of identities, as he applies a christological twist to the Talmudic calendrical sophistry, producing a hybrid of Jewish and Christian dates.

Axioms Revisited

The discussion of lunar calendars is based on a set of agreements that are hardly contested. One of these truisms is that lunar months in the great majority of cultures (except possibly ancient Egypt) begin with the sighting of the first crescent at sunset. That is, day 1 of the lunar month begins with first lunar visibility (in the evening at the western horizon just after sunset) and continues through the following morning until the subsequent sunset. Leo Depuydt, however, contests this notion in his paper. He considers the question of 'beginning of the day – from morning or from the preceding evening', to be irrelevant in daily life since most people were active during daytime only. He then notes the absence of clear statements about the structure of lunar day 1 in any ancient culture, and proceeds to evaluate the evidence for various options for the beginning of the month in the different lunar calendars practiced in Ptolemaic Egypt.

Yigal Bloch uses a wide variety of administrative cuneiform texts to examine the nature of Assyrian calendars of the second millennium. He claims that a purely lunar, non-intercalated calendar was in use in Assyria in the 13th – 12th centuries BCE. Based on his earlier studies on the Assyrian eponym list, he attempts to reconstruct the chronology of this period, while also asking some pertinent questions about the relationship of theoretical time with real life experience—particularly the hard realities of the annual agricultural cycle—in a world where time is regulated (at least in official documents) by a purely lunar calendar.

From Time Indicators to Calendars: Early Lunar Reckonings

Stanislaw Iwaniszewski bases his article on a distinction drawn by M. P. Nilsson in his epoch-making study of primitive time. Nilsson distinguished societies which use markers such as lunar phases as mere indicators for the passage of time from those who use the markers as units in a comprehensive time system. While all other articles address either fully literate or fully illiterate societies, Iwaniszewski's paper examines the transition between these two stages as they find expression in the calendar. His paper draws an exhaustive survey of the uses of lunar phases as time markers throughout the Americas, as divided into the categories mentioned above. The division correlates somewhat with geographical markers, as Mesoamerican and South American societies retained more comprehensive frameworks than those in use in North America. The article supersedes the standard discussions of calendars in the Americas, as it analyzes the evidence by means of the special point of view of the *lunar* calendar in particular. It then continues to draw various ways in which lunar months were aligned with the seasons or with six-month-long half-years.

A curious 'time indicator' in an otherwise fully-calendrical culture is brought forth in the article by Wayne Horowitz on the day of the Sun god in Mesopotamia. While in ancient Mesopotamia time was predominantly marked by the moon, as Horowitz demonstrates from a variety of examples, some time-markers persisted without any clear connection with the lunar calendar. Such is the celebration of a sacred say for Shamash, the Sun God, on the twentieth of each month. Horowitz surveys the religious significance of this day along the use of the signs ^{d}20 to denote the sun god. He suggests some possible directions of deducing astronomical significance from this number, both within the cuneiform tradition and outside it.

Two articles address pre-calendrical societies—or at least societies that lacked the graphical means to express a systematic calendar. Sabine Beckman, in the only contribution in this volume that is explicitly oriented to art and iconography, suggests a 'calendrical' or at least 'seasonal' reading of the iconography of the 'Blue Bird Fresco' from Minoan Knossos. While the Minoan kingdom certainly did employ a calendar of some sort, being an active member in the burgeoning global interaction of the Middle Bronze Age, no datum of astronomy or calendars has reached us in a clear enough way to be interpreted as such. Instead, Beckman offers to read this oeuvre of landscape art as a decoded reference to the Minoan 'calendar', i.e. a depiction of the annual march of the seasons. Saffron, iris, lily, pomegranate and many other plants are analyzed, before she departs from the images of the 'Blue Bird Fresco', buttressing her conclusions with a variety of later classical literary sources. Art history merges with folklore to draw the image of a calendar lost from the grasp of textual scholarship.

James Walton presents the only article in the present collection that uses methods of Archeoastronomy. Basing himself on the more easily analyzable calendar of modern Hopi tribes in New Mexico, Walton reconstructs lunar observations carried out in the area of Chaco and Mesa Verde in what is now New Mexico and Colorado around the 8th – 12th centuries of our era. Tracing the appearance of the moon along appointed times of the year, he shows how the people that constructed these massive adobe housing and administration edifices calibrated the appearance of the moon in conjunction with prominent landmarks, and deduced from them regular calendrical units: months, years, seasons, and even intercalated months.

Conclusion

The themes outlined here are only a sample of the research directions arising from calendrical and astronomical material. This material paves the way for further study by philologists, political historians, theologians, historians of science, and others. But above all the calendar is a primary expression of cultural history, epitomizing in a myriad of ways a plethora of human cultures, cognitive faculties, invented traditions, expressions of identity and nationality, epistemological patterns, and ideology—whether explicit or implicit—which underlie cultural identity. The articles collected here give the reader but a small first taste of these intellectual riches.

Acknowledgements

In addition to the individuals and institutions named in the forward, the editors would like to thank The Bible Lands Museum and its director Amanda Weiss for hosting the Living the Lunar Calendar conference, The Caeno Foundation and Henry Zemel for their contributions to the original meeting, and Rebecca Barclay for her beautiful cover design. Moreover, we would like to thank the speakers at the conference and contributors to this volume for engaging with us in a dialogue about issues of mutual interest and concern over the millennia, and throughout a myriad of cultures, that lived and still live by the rhythms of our shared Moon.

Jonathan Ben-Dov
Wayne Horowitz
John M. Steele

Sunday in Mesopotamia[1]

Wayne Horowitz

When my colleagues and I began to share ideas about the nature of The Living the Lunar Calendar conference, we conceived of a multi-cultural/cross civilization type meeting, where scholars from different fields would come together to discuss a topic of mutual interest—the calendar and the Moon.[2] Thus, it is a small irony that my own paper below deals primarily with the Sun. As such, lets begin then with a review of the Sun and Moon in the world view of the Ancient Near East.

1. The Sun and The Moon in The Ancient Near East, Time Keeping, and Creation

In the Ancient Near East, the Moon-god was the most important deity of the three astronomical siblings. The Moon-god Nanna-Sin was the big brother, and the Sun-god (Utu-Shamash) and Venus (Inanna-Ištar), his little brother and little sister. This reflects, in my opinion, the paramount role of the Moon in time keeping where the Moon has a role in determining not only the month by means of its phases, but also the day and the year. The day, by marking each day of the month by its specific shape, location, and time of rising or setting, for example, the crescent new moon on the western horizon immediately after sunset marking the first of the month; the full moon on the eastern horizon across from the setting Sun on the western horizon marking the middle of the month; and the old Moon and no Moon marking the end of the Month. Thus, any given date of the year, for example the 20th day of the first month Nisan, could be either counted from the new moon of the month, or established by observation of the moon's phases in the sky.

As for the year, it too was primarily measured in Ancient Mesopotamia by means of the Moon. A cycle of 12 new moons marking the passage of regular years, with the occasional leap year of 13 new moons. So, numerous examples of actual observations of the Moon in the context of calendar reckoning in Ancient Mesopotamia, for example in the Neo-Assyrian astronomical reports published by H. Hunger in SAA 8, but which also posit a place for the Sun and the stars in time keeping. For example, for the stars see SAA 8 98, where observations of the stars prompt a call to intercalate the calendar:

> Let them intercalate a month; all the stars of the sky have fallen behind. Adar (Month XII) must not pass unfavourably; let them intercalate.

Likewise, for the Sun, there are numerous examples of astronomical reports relating to the length of the day and night around the time of the spring equinox, and so the new year in

Nisan, for example SAA 8 140–142:

> On the 6th/15th/broken date of Nisan the day and night were in balance: 6 double-hours of daylight, 6 double-hours of night.

Beyond this day to day practical approach, Mesopotamian creation narratives offer a more theoretical, or comprehensive picture of the role of the Moon, Sun, and stars in determining time. Examples include an Akkadian creation vignette that is placed at the end of the lunar section of *Enuma Anu Enlil* as a sort of epilogue to the lunar eclipse omens. Here the Moon-god Sin and Sun-god Shamash take part in the creation of day and night, month and year:[3]

> When Anu, Enlil, and Ea, the great gods,
> heaven and earth built, fixed the astronomical signs;
> established the stellar-positions, [se]t fast the stellar-locations;
> the gods of the night they . [. .]., divided the paths;
> the stars, the likenesses [of them they drew, the constellations;]
> night (and) day, as equa[ls? they measure] d, month and year they created;
> for Sin and Shamash, . . [, the decisions of heave]n and earth they (Anu, Enlil, and Ea) determined.

Parallels where the gods in effect create both astronomy and time include a passage in the bilingual Exaltation of Ištar, known from late-period tablets from Uruk, where the Sun and Moon-gods are again mentioned in the context of the creation of day and night, and the organization of the stars;[4] the small literary fragment K. 7067;[5] and finally, the opening lines of *Enuma Elish* Tablet V, in what might be called the '*Astronomical Book of Enuma Elish*', for which my teacher W.G. Lambert has recently provided a full new English translation in Lambert (2008). Here in *Enuma Elish* V, it is the Babylonian Marduk who assigns the stars, Moon-god Nanna-Sin, and Sun-god Shamash to their jobs in the sky; first ordering the stars to mark the passage of the year (*Enuma Elish* V: 1–8), then the Moon-god Nanna-Sin to mark the days of the month by his phases (beginning with *Enuma Elish* V 11), and finally Shamash to do his duties in a passage that begins somewhere around line 23, in what unfortunately remains the last long broken passage of the epic. Yet, despite the breaks, what is expected of the Sun-god seems clear. The Sun-god must concern himself with justice (lines 23–26):

> 23. I have [....] . the sign, follow its track,
> 24. Draw near. . (. . . . .) give judgment.
> 25. . [. . .] . Shamash, constrain [murder] and violence,
> 26. . [. . . . .] . me.

With the Sun's calendrical astronomical duties relating to day and night expressed much later, in lines 41–42, and 45–46:

> 41. At the new year [. . .
> 42. The year . . . . [. . .

45. After he (Marduk) had [. . .
46. The watches of night and day [. . .

In this context, the reference to the 29th day back in line 36 may perhaps refer to the 29th of Adar, Mesopotamian New Year's Eve, at the end of the 12th and last month of the year:[6]

35. At the end [. . .
36. Let there [be] the 29th day [. . ."

Thus, here in *Enuma Elish* V, as is generally the case in Ancient Mesopotamian civilization, the Sun-god comes in third as a timekeeper, after the Moon and the stars, but does seem to have some responsibility for the passage of day and night, and also the year, perhaps by means of the determining when to intercalate by noting the length of day and night at the spring solstice as in the reports from SAA 8 noted above.[7]

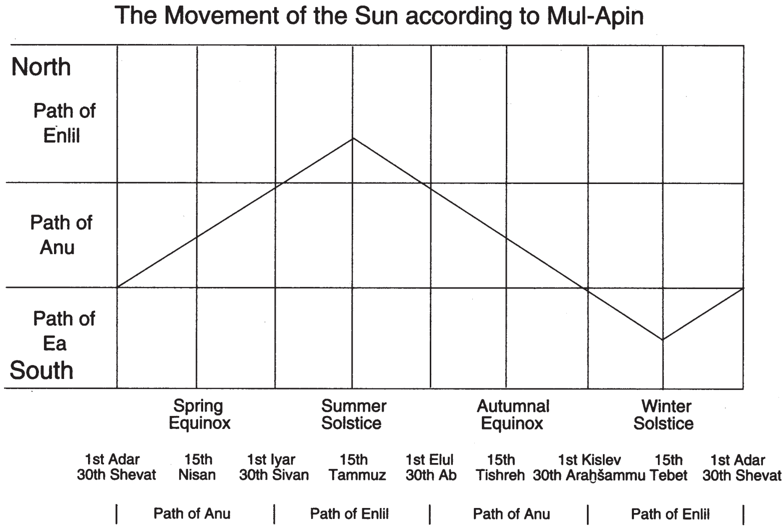
But what exactly is the Sun's role as timekeeper in Ancient Mesopotamia. For day and night, the answer seems obvious. When the Sun-god is present in the sky, it is daytime. When he is absent, it is night. Further, one can mark the parts of the day by observing the Sun's progression across the sky from east to west, and even keep a closer record of solar time by means of a gnomon or sundial.

For the month and year, things are not so simple and not so solar. In this regard, often the Sun's role seems to be defined in terms of the Moon. For example, Mul-Apin Tablet II offers a section correlating the north-south position of the Sun with the seasons of the year; here with north and south defined in terms of the three traditional paths of the stars in the sky—the northern Path of Enlil, central Path of Anu, and southern Path of Ea:

From the 1st of Adar to the 30th of Iyar, the Sun travels in the Path of Anu,
breeze and warm weat[her]
From the 1st of Sivan to the 30th of Ab, the Sun travels in the Path of Enlil,
harvest and heat.
[Fr]om the 1st of Elul to the 30th of Arahsamnu, the Sun travels in the
Path of Anu, breeze and warm weather.
[From the 1st] of Kislev to the 30th of Shevat, the Sun travels in the
Path of Ea, cold weather.[8]

This passage observes quite correctly that the Sun is located in the north (the Path of Enlil) in summer, south (Path of Ea) in winter, and in between (the Path of Anu) in spring and fall. Yet, this observation regarding the Sun cannot be detached from the Moon and stars. The Paths of Anu, Enlil, and Ea are most properly stellar paths,[9] while the dates given for the change of the seasons are ideal lunar dates; the first of the month, the day of the new moon for Adar, Sivan, Elul, and Kislev (Months XII, III, VI, and IX).

Further, the seasons of Mul-Apin are different than our own. Ours start with the equinoxes and solstices, for example the first day of winter on December 21st and the first day of Summer on June 21st, while the solstices and equinoxes in the Mul-Apin system fall midway through the Mul-Apin seasons. For example, the spring equinox on the 15th Nisan in Mul-Apin (Mul-Apin II i 19–21, ii 21) falls midway into the period that the Sun



is in the Path of Anu in late Winter/early Spring. Thus, even the solstices and equinoxes in Mul-Apin, what we would imagine to be purely solar phenomena, are in fact solar-lunar, or even solar-lunar-stellar phenomena, here marked by the position of the Sun, with reference to new or full moons, and the stellar paths.

There are, however, a set of examples in cuneiform where the Sun may be liberated from the Moon, where the Sun-god has his own day which is not the day of the new moon or full moon, and so is not a key day in the monthly lunar cycle. This day, is the 20th of the month, with the 20th of the first month of the year, Nisan the 20th, being the Sun's day par excellence, what we might call Sunday in Mesopotamia.

2. The Sun and the 20th of the Month

Our examination of the Sun, Nisan the 20th, and the 20th of each month, follows in the footsteps of a number of number of previous studies which have noted this special relationship. These include Benno Landsberger way back in 1915 in his *Kultische Kalendar*,[10] W.G. Lambert in 1960 in *Babylonian Wisdom Literature*,[11] Rivka Harris in her 1975 book *Ancient Sippar*,[12] M.E. Cohen in his 1993 *Cultic Calendars of The Ancient Near East,*[13] A. Livingstone's study in the same year,[14] and finally Stefan Maul in the 1999 Festschrift of Johannes Renger in a discussion of rituals for the Sun-god in his holy city of Sippar.[15]

Our first piece of evidence will be a little piece of cuneiform gammatria, the obvious observation to those trained in cuneiform studies, that the Sun god's special number (20) matches his day—this according to a tradition whereby the major gods of Ancient Mesopotamia each had a special number, for example 60 for the King of Heaven Anu, 50 for the King of Earth Enlil, 40 for Ea, 30 for the Moon-god (= the number of days of the month), 15 for Ištar, and so on.[16] Hence, when writing a god's name, one could write the divine determinative DINGIR, and then the number. For example ^{d}30 for the Moon-god and ^{d}20 for the Sun-god.

Now the evidence for the 20th of the month, more specifically the 20th of Nisan, and the Sun-god. We begin with the great Akkadian hymn to the Sun-god, *The Shamash Hymn*, itself consisting of 200 (i.e. 20 × 10 lines), that was edited by Lambert in *Babylonian Wisdom Literature*, where the Sun's day on the 20th is a day of joy, when the Sun partakes of beers and ale, and then delivers petitioners from harm:

> On the 20th day (UD.20.KAM) you exult with mirth and joy,
> You eat, you drink their pure ale, the bartender's beer from the market.
> They pour out the bartender's beer for you and you accept.
>
> You deliver safely people surrounded by mighty waves.
> In return you receive their pure, clear libations
>
> You drink their mild beer and ale,
> The you fulfil the desires they conceive.[17]

Two more passages in Lambert's *Babylonian Wisdom Literature* confirm this date as the Sun's day. First a passage included by Lambert in his group 'Popular Sayings', which alludes to the prayer to the Sun-god, 'Shamash, the 20th day is your bright day".[18]

> The fowler cast his net persistently prayed to Shamash: "Shamash, the 20th day (UD.20.KAM) is your bright day."

Our final example gives the text of this prayer, actually an incantation:[19]

> Incantation: "Shamash, the 20th day (UD.20.KAM) is your bright day"
> The 20th day is bright, Ebabbar (your temple) is brig[ht]
> Just as on the 20th day your eyes[ight] is bright
> May their eyesight [too be bright?. . . . .]
> An Enu[ru] incantation

What is happening in this incantation, apparently to cure eye problems, is a little unclear, but I think we can agree with Lambert who writes:[20]

> A comparison of the three passages suggests that the twentieth day was the occasion of asking favours of the Sun-god when he could least refuse," apparently because of his beer induced mirth in The Shamash Hymn.

Yet what is happening in these passages is for us now of less concern than the observation that the three passages all make clear that it was popular belief that the 20th of each month was the Sun's day. This common knowledge also finds reflection throughout the width and breath of cuneiform tradition. For example the late-Babylonian ritual tablet BM 50503 from the Sun's city Sippar from the first millennium (Neo or Late-Babylonian), edited by Stefan Maul in the Festschrift of Johannes Renger, which speaks of rituals of the Sun-god on the 8th and 15th of the month, which can be taken as the time of, or just after, quarter and full moon, and then later in the month on the 20th, a date which has no obvious lunar resonance.[21] Likewise, in the *Lipšur* litanies it is the Sun-god who is invoked on the 20th of the month to release, absolve, free (*pašāru*) a supplicant from sin, divine anger, a curse, an oath etc:[22]

> [U]D.20.KAM *lip-šur šá* ^{d}*Šamaš* (UTU)
> May the 20th day absolve, that of Shamash

3. The 20th of Nisan and Astronomy

A further connection between the Sun-god, his festivals, and the 20th of the month is suggested in Mesopotamian astronomical texts where the 20th of Nisan marks the beginnings of annual astronomical cycles. For example, in another passage from Mul-Apin, this time Mul-Apin I iv 10–14, where the beginning of a series of annual observations of *ziqpu*-stars (stars which culminate overhead an observer of the sky),[23] is set on the 20th of Nisan:

> If you are to observe the *zipqu*, you stand
> in the morning before sunrise, West to your right,
> East to your left, your face directed towards South;
> on the 20th of Nisan the *kumāru* of the Panther stands in the middle of the sky
> opposite your breast, and the Crook rises.

So too the end of another *ziqpu*-star list on the Neo-Babylonian astronomical fragment BM 38269+77242, which I myself edited in Horowitz (1994):

20. [A tota]l? of 12 leagues (360°) of the circle of the *zi*[*qpu*-(stars)]
21. amidst the stars of the Path of [Enlil]

---

22. From (the constellation) ŠU.PA to . [. .]
23. which the observer of the sky [sees] at [night]
24. and the risings and settings of the s[tars in their midst]

---

25. Each day, one degree, the star[s from the morning]
26. into the evening go [in]

---

27. Each day, one degree, the star[s]
28. from the evening into the [morning go out]
29. In the month of Nisan, on the 20th . [. . .
30. . [. . .

(end of fragment)

In both these *ziqpu*-star texts, it would appear that the annual cycle of the *ziqpu*-stars begins on the 20th of Nisan, with the second example describing the sequence of *ziqpu*-stars as a circle (12 leagues in Babylonian geometry = 12 × 30° = 360°); this stellar circle being realized at a rate of 1° per day of change in stellar position. This, without doubt, refers to the Ancient Mesopotamian ideal 360 day year of 12 months × 30 days, with this year somehow culminating, or at the very least somehow connected with the 20th of Nisan.

Again our line 29:

> 29. In the month of Nisan, on the 20th . [. . .

In any case, both here and in Mul-Apin, I would argue, the 20th of Nisan marks the start of an annual stellar sequence, thus making the 20th of Nisan, given its connections with the Sun-god, a sort of solar-stellar New Year's Day.

This is also the case, for the Sun-god Shamash at least, in two Old Babylonian period oracular inquiries of a certain Ur-Utu, a man whose name means literally 'The Dog of the Sun', i.e. 'The Servant of the Sun-god'. This Ur-Utu comes from Tel-ed-Der (Ancient Sippar Amnanum), a suburb of the Sun-god's main Mesopotamian city, Sippar, what one might call Sun-city Mesopotamia. In Ur-Utu's inquiries, one again finds an ideal annual cycle of 360 days that here begins and ends on the 20th of Nisan:[24]

> O God, my lord Ninsianna, accept this offering, stand by me when this offering is made, place there an oracle of well-being and life for Ur-Utu, your servant! Concerning Ur-Utu, your servant, who is now standing by this offering, from the 20th of Nisan until the 20th of Nisan of the coming year, six times sixty days, six times sixty nights, . . .

This formula, which reminds me in part of the Jewish Kol Nidre prayer where one speaks of a year from Yom Kippor *zeh* (this Yom Kippor) *ad yom kippor haba* (until the Yom Kippor to come), would seem to presume that the 20th of Nisan from one year to the next marks an annual solar cycle of 360 days. Given the above, I would propose that the 20th of Nisan, the 20th of the first month of year, is in effect the first Sunday of the year—'Sunday in Mesopotamia'.

4. 'Sunday' and 'The Blessing of the Sun'

The Mesopotamian celebrations of the 20th of Nisan came to my mind when I was a witness and participant in the traditional Jewish ceremony '*Birkat Hachamah*' (The Blessing of the Sun), just outside my synagogue in the Judean Desert facing east looking at the Sun rising over the Dead Sea on the 8th of April 2009 (= the 14th of Nisan 5769 in the Jewish calendar). This is one of the few dates in the Jewish calendar which is determined by the Sun, and not the Moon, with the Sun being blessed as it completes its 28 year cycle, dating back in time and place to the creation of the Sun which Jewish tradition holds to be sunrise on the 4th day (Wednesday) of the first week of the first month, Nisan, in line with Genesis 1: 14–19:[25]

> 14 And God said: 'Let there be lights in the firmament of the heaven to divide the day
> from the night; and let them be for signs, and for seasons, and for days and years;
> 15 and let them be for lights in the firmament of the heaven to give light upon the earth.'
> And it was so.
> 16 And God made the two great lights: the greater light to rule the day, and the lesser light
> to rule the night; and the stars.

Thus, without going into this in greater detail, one might assume that the date of the

Blessing of the Sun would be pegged to Nisan the 4th, in the lunar calendar, but a look at the dates of the Blessing of the Sun in recent and coming times demonstrates that this is not so:

* Wednesday, 7 April 1897 (5 Nisan 5657)
* Wednesday, 8 April 1925 (14 Nisan 5685 – Erev Pesach/Passover Eve)
* Wednesday, 8 April 1953 (23 Nisan 5713)
* Wednesday, 8 April 1981 (4 Nisan 5741)
* Wednesday, 8 April 2009 (14 Nisan 5769 – Erev Pesach/Passover Eve)
* Wednesday, 8 April 2037 (23 Nisan 5797)
* Wednesday, 8 April 2065 (2 Nisan 5825)
* Wednesday, 8 April 2093 (12 Nisan 5853)
* Wednesday, 9 April 2121 (21 Nisan 5881)

Clearly, the system is pegged to the solar year, not the lunar year, or as I put it earlier in the context of the 20th of Nisan, the Sun here in Jewish calendrical tradition too is liberated from the Moon, perhaps even echoing what might have been a presumed solar year or solar cycle of some sort that the Jewish community of Babylonia might have learned from their neighbours.

Yet, in all honesty, I must admit that I am still working on all this and cannot for now demonstrate a connection between the aforementioned Babylonian and Jewish practices, even though the connections between late-Babylonian astronomy and calendrical practices, and those of early Judaism are now becoming ever more clear.[26] Thus, I leave as a working hypothesis that the materials which I presented in the first parts of my presentation point to an often overlooked solar aspect in the Babylonian calendrical tradition, that later found much fuller expression in Jewish tradition, most likely at the site famous for its solar calendar in Jewish tradition, Qumran.

Notes

1. The following includes some material that was omitted at The Living the Lunar Calendar conference due to lack of time. Standard Assyriological abbreviations are as in The Chicago Assyrian Dictionary (CAD) and/or The Pennsylvania Sumerian Dictionary (PSD).
2. I would like to take this opportunity to thank all those who attended the conference, and in particular the organizers of the conference: Amanda Weiss of The Bible Lands Museum and Henry Zemel of the Caeno Foundation, as well as my partners on the academic organizing committee Yonatan Ben-Dov of Haifa University and John Steele of Brown University.
3. K 5981 (+) 11867:1–7 // VAT 9805+ 14'–17' (collated). Horowitz (1998), pp. 146–147, Rochberg-Halton (1988), pp. 270–271.
4. Horowitz (1998), pp. 144–145 with previous bibliography.
5. Horowitz (2010).
6. The 29th of Adar (or of intercalary Adar in leap years) is the last day that must occur in a Mesopotamian lunar year. If the month was a hollow month, then the 29th was the last day of the year. Whether the following day was 30th or New Year's Day (Nisan 1) depended on when the new moon became visible.
7. Note that *Enuma Elish* itself places the stars first, instead of the Moon, as might have been expected. This, however can be explained in two ways. First, because the stars here are regulated by Marduk himself, in his astronomical guise as his star ^{mul}*Nēberu* ('The Crossing'), and second because *Enuma Elish* V seems to

consider time-units from the longest to shortest—the year first, then the month, then the day, and finally the parts of the day, namely the watches of the night and day in line 46.

8. Mul-Apin II Gap A: 1–7.
9. Horowitz (1998), pp. 252–258.
10. Landsberger (1915), pp. 137–138.
11. See below.
12. Harris (1975), pp. 199–202.
13. Cohen (1993), pp. 274–275.
14. Livingstone (1993), p. 110. The author also thanks Prof. Livingstone for access to some unpublished materials regarding the place of the Sun-god on the 20th day in the hemerologies.
15. Maul (1999); see also Zawadzki (2005).
16. K. 170+ (Livingstone (1986), pp. 30–31). See the commentary on p. 48 for the two comrades (*tappû*) of the Sun-god, the fire-gods Gibil and Nuska in rev. 5 (Livingstone (1986), pp. 32–33), whose number is 10 each. Hence the 2 gods × 10 = 20 = Shamash.
17. Shamash Hymn: 156–162; Lambert (1960), pp. 136–137 with commentary on p. 323.
18. Lambert (1960), p. 221.
19. Lambert (1960), p. 341.
20. Lambert (1960), p. 341
21. Maul (1999), pp. 303–305 discusses the Sun-god's ceremonies on the 20th of the month and suggests a connection with a '*Schema der Sieben-Tage-Woche*'.
22. Wiseman (1969), p. 178. Cf. George (1992), p. 152 § 12 9' in The Nippur Compendium: UD.20.KAM ^{d}UTU.
23. For the *ziqpu*-stars and *ziqpu*-star texts see Hunger-Pingree (1999), pp. 84–90 and Al-Rawi-Horowitz (2001).
24. Adapted from the translation in Foster (1993), p. 153.
25. The number of years in the 28 year cycle is determined by the fact that the solar year lasts 365 1/4 days = 52 weeks (364 days) + 1 day + 1/4. Thus, for the Sun to return to a specific Wednesday at sunrise requires 7 cycles of 4 years: the 7 for the days of the week to get back to Wednesday, the 4 to get back to the right time of day given the difference of 1/4 day per year (7 × 4 = 28).
26. See, e.g., Ben-Dov (2008).

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Middle Assyrian Lunar Calendar and Chronology

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I. Introduction

Reconstructing the chronology of an ancient civilization depends on reconstructing its calendar. In a series of earlier studies, the present author has dealt with two aspects of the chronology of Assyria in the 13th–12th centuries B.C.E.: the order of the yearly eponyms during the reigns of Shalmaneser I and Tukultī-Ninurta I,[2] and the problems posed by the text of the Assyrian King List, solving which allows one to reconstruct a continuous chronology of the kings of Assyria in the second half of the second millennium B.C.E. (the Middle Assyrian period).[3] In this article, we will discuss the structure of the Middle Assyrian calendar.

Our discussion will proceed in five stages. First, we will present the fundamentals of our topic: the distinction between the original Assyrian calendar and the southern Mesopotamian (Babylonian) calendar, which was adopted in Assyria during the reign of Tiglath-pileser I; the basic characteristics of those calendars (both of which were based on lunar months); and the different proposals raised by scholars with regard to the question whether intercalation (i.e., addition of a thirteenth month to the year once in a while in order to keep the calendar in pace with the solar year cycle) was practiced in the original Assyrian calendar.

At the second and the third stages of our discussion, we will consider two specific proposals for the mechanism of intercalation that might have been employed in the original Assyrian calendar. We will argue that these two proposals cover all the reasonable possibilities of intercalation that could have been practiced in the Middle Assyrian period, but none of them was actually employed in that calendar (at least in the 13th–12th centuries B.C.E.), judging by the available evidence.[4] Thus, we will conclude that during the 13th–12th centuries B.C.E., the Assyrian calendar must have been purely lunar, without intercalation (similar to the modern Islamic calendar).

At the fourth stage of our discussion, we will utilize the above conclusion, along with some more information, to determine the precise absolute date—i.e., a Julian date expressed in the Common Era frame of reference—for the beginning of the first regnal year of Tiglath-pileser I (1114/3 B.C.E.). That, in turn, will enable us to convert any Middle Assyrian calendar date into an absolute date with almost full precision (allowing for a margin of error of a day or two at most). A table listing the absolute dates for the first day of each Assyrian calendar year in the 13th–12th centuries B.C.E. will be provided at the end of the present article.

At the fifth stage of our discussion, we will raise the question when the lunar calendar without intercalation was first adopted in Assyria, and we will point to a prospective direction of study which may supply at least a part of the answer to this question. However, we will not be able to pursue that direction in our present study, and will therefore leave the question open. We will conclude by considering the question of how the inhabitants of ancient Assyria in the 13th–12th centuries B.C.E. could have determined the timing of agricultural works (which would be naturally dependent on the solar year cycle) in a purely lunar calendar.

II. Assyrian and Babylonian Calendars – Fundamentals

The reign of Tiglath-pileser I was a turning point in the history of the calendar in the ancient Assyrian kingdom. During his reign, Assyria adopted a calendar, which had already existed by that time for several centuries in southern Mesopotamia—the so-called Standard Mesopotamian calendar.[5] Since during the second half of the second millennium B.C.E., the most important polity using this calendar was Babylonia (under the rule of the Kassite, and then the Second Isin, dynasties), it is justified to call it the Babylonian calendar.[6]

The Babylonian calendar had twelve lunar months: Nisannu, Ayyāru, Simānu, Duʾūzu, Abu, Ulūlu, Tašrītu, Araḫšamnu, Kissilīmu, Ṭebētu/Kanūnu, Šabāṭu and Addaru. The names of these months were normally rendered in writing by Sumerian logograms, originating from the Nippur calendar of the third millennium B.C.E.[7] Each month began with the sighting of the new crescent of the moon and lasted normally 29 or 30 days, dependent on the length of the particular synodic month—the period between two subsequent identical phases of the moon (the average length of the synodic month is ca. 29.53 days). Since the beginning of the new month depended on the sighting of the new lunar crescent, rather than on the moment of the astronomical New Moon conjunction, occasional occurrences of months consisting of 28 or 31 days would be possible, although such months must have been very rare.[8] Twelve lunar months amount on the average to ca. 354.36 days, which is 10.89 days less than the tropical solar year (ca. 365.25 days). Consequently, in order to keep the calendar in pace with the solar year, the years in the Babylonian calendar were occasionally intercalated. That was done by adding a thirteenth month to the year—either the second Ulūlu (recorded as $^{\mathrm{ITU}}$KIN.$^{\mathrm{d}}$INANNA.2.KAM) or the second Addaru (recorded as "the additional Addaru", $^{\mathrm{ITU}}$DIRI.ŠE.KIN.KUD, or occasionally simply as "the additional month", $^{\mathrm{ITU}}$DIRI).[9] In other words, the Babylonian calendar was not purely lunar but luni-solar. Since in the long run, intercalation was intended to keep the lunar calendar dates in pace with the solar year, one can assume that on the average, the thirteenth month would be added once in 29.53 / 10.89 = ca. 2.7 years.

As mentioned above, the Babylonian calendar was adopted in Assyria in the reign of Tiglath-pileser I.[10] Since the average length of the Babylonian calendar year was kept in pace with the average length of the solar (Julian) year through the practice of intercalation, and since precise continuous chronology of the kings of Assyria in the 11th–8th centuries B.C.E. can be established based on the evidence of the Assyrian King List, the lists of Assyrian yearly eponyms and some other sources, one can determine the absolute dates of the reign of Tiglath-pileser I, with near certainty, as 1114–1076 B.C.E.

Before the reign of Tiglath-pileser I, the calendar practiced in Assyria consisted of twelve months with wholly different names (see table 1 below). Those months were lunar, as is clear from the fact that they lasted either 29 or 30 days.[11] The question is whether the Middle Assyrian calendar, practiced before the adoption of the Babylonian calendar by Tiglath-pileser I, employed any mechanism for intercalation.

Among ca. two thousand dated Assyrian documents from the second half of the second millennium B.C.E., published until today,[12] none mentions an intercalary Assyrian month. Hence, it appears that intercalation by the addition of a specifically designated thirteenth month to a year, as known from the Babylonian calendar, was not practiced in Assyria in the relevant period. This situation was clear already by the 1920s, and scholars working on reconstruction of the Middle Assyrian calendar had to propose other mechanisms of intercalation, if they thought that intercalation was practiced in Assyria in the second half of the second millennium B.C.E.

The first scholar to propose a specific mechanism of intercalation for the Middle Assyrian calendar was Ernst Weidner. According to his proposal, first made in the 1920s and re-iterated a decade later, the twelve months of the Middle Assyrian calendar followed one after the other in an unbroken cycle without any month being ever added to that cycle for the purpose of intercalation; however, the starting point of the calendar year could move from one month to another. Thus, if a regular year began, e.g., with the month Ṣippu, it would contain twelve months exactly and end with the month Ḫibur, the next year starting again on the first day of Ṣippu. If, however, a year starting with the month Ṣippu was to be intercalated, then the month Ṣippu following after the twelfth month of the year, Ḫibur, would be included in the same year as the thirteenth month, and the next calendar year would begin not on the first day of Ṣippu but on the first day of the following month, Qarrātu.[13] In other words, in Weidner's reconstruction, the sequence of Middle Assyrian months would move throughout the solar year, but the beginning point of the Middle Assyrian calendar year would always be limited to a specific season of the solar year cycle. Before the mid-1990s, scholars generally adopted Weidner's proposal.[14]

A different mechanism of intercalation for the Middle Assyrian calendar was proposed by Johannes Koch in 1989. According to Koch's proposal, intercalation in the Middle Assyrian calendar was intended to keep each calendar month, though not the beginning point of the year, in a more or less fixed position within the solar year cycle. Hence, when during a given year, the decision about intercalation was made, the intercalary month would be added at the beginning of the following year, bearing the same name as the last month of the current year; the new year, containing twelve months just as the preceding one, would end with a month that occupied, in the terms of the twelve-months cycle, one position earlier than the last month of the preceding year. E.g., if a given calendar year began on the first day of the month Ṣippu, ended twelve months later with the last day of the month Ḫibur, and the decision about intercalation was made during that year, then the month following Ḫibur would be not Ṣippu but yet another Ḫibur, reckoned as the first month of the next calendar year. That next year would now end not on the last day of Ḫibur (located twelve months after the end of the intercalary month) but one month earlier, on the last day of the month Abu-šarrāni; the subsequent year would then begin on the first day of Ḫibur, and so on.[15] Starting from the late 1990s, several scholars expressed their support for Koch's proposal.[16]

The intercalation mechanisms proposed by Weidner and Koch can be summarized in table 1.

Weidner	Koch
1. Ṣippu	1. Ṣippu
2. Qarrātu	2. Qarrātu
3. Kalmartu	3. Kalmartu
4. Sîn	4. Sîn
5. Kuzallu	5. Kuzallu
6. Allānātu	6. Allānātu
7. Bēlat-ekalli	7. Bēlat-ekalli
8. Ša-sarrāte	8. Ša-sarrāte
9. Ša-kēnāte	9. Ša-kēnāte
10. Muḫur-ilāni	10. Muḫur-ilāni
11. Abu-šarrāni	11. Abu-šarrāni
12. Ḫibur	12. Ḫibur
13. Ṣippu	
1. Qarrātu	*1. Ḫibur*
2. Kalmartu	2. Ṣippu
3. Sîn	3. Qarrātu
4. Kuzallu	4. Kalmartu
5. Allānātu	5. Sîn
6. Bēlat-ekalli	6. Kuzallu
7. Ša-sarrāte	7. Allānātu
8. Ša-kēnāte	8. Bēlat-ekalli
9. Muḫur-ilāni	9. Ša-sarrāte
10. Abu-šarrāni	10. Ša-kēnāte
11. Ḫibur	11. Muḫur-ilāni
12. Ṣippu	12. Abu-šarrāni
1. Qarrātu	1. Ḫibur
. . .	. . .

TABLE 1. Mechanisms of intercalation proposed for the Middle Assyrian calendar by Ernst Weidner and Johannes Koch (the intercalary month appears in italics, the horizontal line marks the beginning of a new year).

In contradistinction to the abovementioned proposals, several scholars maintained that intercalation was not practiced at all in the Middle Assyrian calendar.[17] Yet, those scholars did not substantiate their proposal to any satisfactory degree, and their view came under considerable criticism during the last decade.[18] In this study, we will offer sufficient evidence to substantiate the view, which holds that the Middle Assyrian calendar was purely lunar and did not employ any mechanism for intercalation.

III. Why Middle Assyrian months were not confined to a single season of the solar year cycle

Once we accept the idea that there were no specifically designated intercalary months in the Middle Assyrian calendar (given that the available evidence offers no indication of their existence), there are only two possibilities for intercalation in that calendar. Either the beginning point of the year would be fixed to a specific season of the solar year, at the expense of allowing the months to move backward through the solar year cycle (with each given day of a given calendar month occurring ca. 10.89 days earlier, in the terms of the solar year cycle, than it occurred in the preceding year), or the months would be fixed to specific seasons of the solar year, at the expense of allowing the beginning point of the year to move backward through the solar year cycle. Hence, the mechanisms of intercalation proposed by Weidner and Koch are the only possible mechanisms of intercalation that could exist in the Middle Assyrian calendar. Demonstrating that neither of these mechanisms was actually employed in the Middle Assyrian calendar is tantamount to proof that the Middle Assyrian calendar was purely lunar, with a year consisting always of twelve lunar months (ca. 354.36 days on the average). We will begin our demonstration by analyzing the intercalation mechanism proposed by Johannes Koch.

1. The unjustified foundations of Koch's proposed mechanism of intercalation

Koch's proposal was explicitly grounded in the idea that each month of the Middle Assyrian calendar was associated with the heliacal rising (just before the sunrise) of a given group of stars—which, of course, would necessitate that each Middle Assyrian month be confined to a more or less fixed position within the solar year cycle.[19] However, there is absolutely no evidence that Middle Assyrian months were associated with the heliacal rising of specific groups of stars. Such association is known for the Babylonian months; even though the earliest text clearly expressing it—*KAV* 218, known as Astrolabe B—was found in the excavations of the Assyrian capital city of Aššur, that text operates exclusively in the terms of Babylonian months and reflects a cosmological view that also finds expression in the Babylonian creation epic, Enūma eliš.[20] Astrolabe B is, in all likelihood, a copy from a Babylonian original, executed by the scribe Marduk-balāssu-ēriš son of Ninurta-uballissu, a member of a scribal family stemming from Babylonia that was active in Aššur during the second quarter of the 12th century B.C.E.[21] There is no evidence that would allow to postulate the association of months with the heliacal rising of specific groups of stars for the original Assyrian calendar.

2. The movement of Assyrian months through the solar year cycle in the reign of Tiglath-pileser I.

In fact, Koch's proposed mechanism of intercalation contradicts one of the most important elements of evidence for reconstructing the character of the Middle Assyrian calendar. This evidence consists of a group of texts from the reign of Tiglath-pileser I, which include date formulae identifying Assyrian months with specific months of the Babylonian calendar. The correspondences between the Assyrian and the Babylonian months change over the different eponym years dating the relevant documents. The texts containing double-date

VAT 16400 (*MARV* I 73)[23] 5) *i+na* ^{ITU}*ḫi-bur* ^{ITU}NE UD.20.KÁM 6) *li-me* ^{m}IZKIM-IBILA-É.ŠÁR.RA 7) MAN ^{KUR}Aš-šur	In the month Ḫibur (which is) the month Abu, day 20, the eponym year of Tiglath-pileser (I), the king of Assyria
VAT 20159 (*MARV* IX 42) 1') [^{ITU}]*ḫi-bur* ^{ITU}NE [UD.x.KÁM] 2') [*l*]*i-mu* ^{m}IZKIM-[IBILA-É.ŠÁR.RA] 3') [LUGA]L$^{?}$ KUR[*Aš-šur*]	[The month] Ḫibur (which is) the month Abu, [day x], the [ep]onym year of Tiglath-[pileser (I), the kin]g of [Assyria]
VAT 130984 (*MARV* I 62) 9) ⸢^{ITU}⸣*šá-ke-na*$^{!}$*-a-tu* ⸢^{ITU}⸣BÁR UD.6.KÁM 10) [*l*]*i-mu* ^{m}*Ḫi-ia-ša-iu-ú*	The month Ša-kēnāte (which is) the month Nisannu, day 6, the [ep]onym year of Ḫiyašāyu
VAT 15468 (*MARV* V 42) 17) ⸢^{ITU}*a-bu*-MAN⸣.ME[Š-*ni*] ⸢^{ITU}SIG$_4$⸣ UD.24.KÁM 18) *li-mu* ⸢^{m}*Ḫi-ia-ša-iu-ú*⸣	The month Abu-šarr[āni] (which is) the month Simānu, day 24, the eponym year of Ḫiyašāyu
VAT 17921 (*MARV* V 43) 10) ^{ITU}*kal-mar-tu* ^{ITU}⸢BÁR⸣ 11) ⸢UD.18⸣.KÁM ⸢*li-mu*⸣ 12) ^{md}⸢*A-šur*-MU⸣-KAM	The month Kalmartu (which is) the month Nisannu, day 18, the eponym year of Aššur-šuma-ēriš
RIMA 2, A.0.87.4 94) ^{ITU}*ḫi-bur ša tar-ṣi* ^{ITU}GAN UD.18.KÁM *l*[*i-mu* ^{m}*Tà*]*k-lak-a-na-*^{d}*A-šur*	The month Ḫibur, which is during the month Kissilīmu, the ep[onym year of Ta]klāk-ana-Aššur

Table 2. A selection of date formulae of documents and transactions, employing parallel Assyrian and Babylonian month names, in the reign of Tiglath-pileser I.

formulae of the abovementioned kind have been extensively surveyed by Helmut Freydank,[22] and a sample of those formulae appears in table 2.

As can be seen from the table, in the eponym year of Tiglath-pileser I (which was probably his first regnal year, 1114/3 B.C.E.),[24] the Assyrian month Ḫibur corresponded to the Babylonian month Abu (the 5th month of the Babylonian calendar). In the eponym year of Ḫiyašāyu, the Assyrian months Ša-kēnāte and Abu-šarrāni corresponded to the Babylonian months Nisannu and Simānu, respectively; and given the order of the months in the two calendars, this means that Assyrian Ḫibur corresponded in that year to Babylonian Duʾūzu (the 4th month of the Babylonian calendar). In the eponym year of Aššur-šuma-ēriš, the Assyrian month Kalmartu corresponded to the Babylonian month Nisannu, which means that Assyrian Ḫibur corresponded in that year to Babylonian Ṭebētu/Kanūnu (the 10th month of the Babylonian calendar). Finally, in the eponym year of Taklāk-ana-Aššur, Assyrian Ḫibur corresponded to Babylonian Kissilīmu (the 9th month of the Babylonian calendar).

In other words, double-date formulae in Assyrian documents from the reign of Tiglath-pileser I indicate that the Assyrian calendar months moved all the way through the Babylonian year. This suggests that the Assyrian months also moved all the way through the solar year cycle, which would contradict Koch's proposal. In order to counter this evidence, Koch assumed that the recording of Babylonian months in Assyrian documents reflected an artificial procedure of the Assyrian scribes, which did not take into account the actual intercalation practice in Babylonia and treated the twelve months of the Babylonian calendar as forming an unbroken cycle without intercalary months.[25] Since Koch assumed that intercalary months were added upon necessity to the Assyrian calendar, his proposal means that every 2.7 years on the average, the Assyrian months would move one month forward in the terms of correspondence to the Babylonian months.

Koch even went so far as to claim that the double-date formulae in some documents from the reign of Tiglath-pileser I constitute evidence in favor of his proposal. He cited the document VAT 16400 (*MARV* I 73), which indicates that in the eponym year of Tiglath-pileser I the Assyrian month Ḫibur corresponded to the Babylonian month Abu, and compared it to another document, VAT 16394 (*MARV* II 2), which indicates that in the same eponym year, the Assyrian month Muḫur-ilāni corresponded to the Babylonian month Duʾūzu,[26] so that the Assyrian month Ḫibur would correspond to the Babylonian month Ulūlu. Koch explained this contradiction by arguing that for the purposes of intercalation, the Middle Assyrian "normal year" ("*Normaljahr*") was counted from spring equinox to spring equinox, but the eponym year began at a different point of time. Thus, according to Koch, the eponym year of Tiglath-pileser I began in the month Ḫibur (corresponding to Babylonian Abu) of a "normal year" that began in the month Ša-sarrāte (corresponding to Babylonian Nisannu); however, during that "normal year" a decision about intercalation was made, and the month Bēlat-ekalli (corresponding to Babylonian Addaru) was followed by another month of the same name, which now corresponded to Babylonian Nisannu and began a new "normal year," so that the month Muḫur-ilāni, at the end of the eponym year of Tiglath-pileser I, corresponded not to Babylonian Simānu but to Babylonian Duʾūzu.[27]

However, Koch's proposal cannot be sustained. First, there is no evidence whatsoever that the Assyrians used in their calendar any concept of a year different from that of the eponym year (whatever the beginning and end points of the latter).[28] Second, Koch's analysis of the sources lead him to admit that a given eponym year could include two adjacent months by the same name (in our case, the eponym year of Tiglath-pileser I would include two months by the name Bēlat-ekalli, the first parallel to Babylonian Addaru, the second parallel to Babylonian Nisannu, and each belonging to a different "normal year"). Now, if every two or three years, there was an eponym year that included two adjacent months by the same name, it is hardly conceivable that administrative recording could function without making an explicit distinction between those two months (as was done in the Babylonian calendar by means of designating the intercalary month with the logogram DIRI or recording it as ITU.MN.2.KAM, where MN is a month name).[29] Yet, no distinctions of this kind are ever attested in Middle Assyrian documents.

In fact, it appears that the correspondence between Assyrian Muḫur-ilāni and Babylonian Duʾūzu in *MARV* II 2 is nothing more than a scribal error, reflecting an insufficient familiarity of the Assyrian scribe who produced this document with the Babylonian calendar (in a period when the Babylonian calendar was in the process of being introduced into Assyrian administrative recording).[30] This interpretation of *MARV* II 2, proposed by Freydank,[31] finds a clear parallel in documents dated to the eponym year of Ḫiyašāyu. As mentioned in table 2 above, the document *MARV* V 42 specifies the Assyrian month Abu-šarrāni as corresponding to the Babylonian month Simānu in the eponym year of Ḫiyašāyu. On the other hand, the document VAT 20118 (*MARV* IX 16) specifies the Assyrian month Abu-šarrāni as corresponding to the Babylonian month Duʾūzu in the eponym year of Ḫiyašāyu.[32] Koch's proposed mechanism of intercalation can account for two Assyrian months by the same name belonging to a single eponym year if those months occur around the spring equinox,[33] but not in summer (as happens with the months corresponding to Babylonian Simānu and Duʾūzu). Thus, the specification of Babylonian months corresponding to the months of the Assyrian calendar in both *MARV* II 2 and *MARV* IX 16 is most reasonably explained as a scribal error.[34]

As for Koch's more general proposal concerning the procedure of recording the parallel Assyrian and Babylonian dates in Assyrian documents from the reign of Tiglath-pileser I, it is refuted by the following considerations. As noted above, Koch's proposal implies that every 2.7 years on the average, the Assyrian months moved one month forward in the terms of correspondence to the Babylonian months. Since in the eponym year of Tiglath-pileser I, Assyrian Ḫibur corresponded to Babylonian Abu, and in the eponym year of Aššur-šuma-ēriš, Assyrian Ḫibur must have corresponded to Babylonian Ṭebētu/Kanūnu, it follows that during the period, which elapsed between these two eponym years, the Assyrian months moved five months forward in the terms of correspondence to the Babylonian months (or seven months backward, dependent on the direction in which one counts). Furthermore, since in the eponym year of Taklāk-ana-Aššur, Assyrian Ḫibur corresponded to Babylonian Kissilīmu, it follows that during the period, which elapsed between the eponym years of Aššur-šuma-ēriš and Taklāk-ana-Aššur, the Assyrian months moved eleven months forward (or one month backward) in the terms of correspondence to the Babylonian months.

Now, the inscription RIMA 2, A.0.87.4, written in the name of Tiglath-pileser I, speaks of a military campaign carried out by Tiglath-pileser I against the Babylonian king Marduk-nādin-aḫḫē in the eponym years of Aššur-šuma-ēriš and Ninuʾāyu; the inscription itself is dated to the eponym year of Taklāk-ana-Aššur.[35] This means that both the eponym years of Aššur-šuma-ēriš and Taklāk-ana-Aššur belonged to the reign of Tiglath-pileser I. But if we assume, with Koch, that the Assyrian months moved one month forward, in the terms of correspondence to the Babylonian months as recorded in Assyrian documents during the reign of Tiglath-pileser I, each 2.7 years on the average, then it follows that from the eponym year of Tiglath-pileser I to the eponym year of Taklāk-ana-Aššur there elapsed $5 \times 2.7 + 11 \times 2.7 =$ ca. 43 years. Which is, of course, impossible, since the eponym year of Tiglath-pileser I belongs clearly to his reign (and is probably to be identified with his first regnal year),[36] and the whole reign of Tiglath-pileser I lasted, according to the Assyrian King List, 39 years.[37]

On the other hand, if we assume that the Babylonian months recorded in Assyrian documents from the reign of Tiglath-pileser I were real months of the Babylonian calendar, with the Babylonian practice of intercalation taken into account, and the Assyrian months recorded in the same documents followed one another in an unbroken cycle, without insertion of any intercalary months,[38] then the Assyrian months must have moved one month backward, in the terms of correspondence to the Babylonian months, each 2.7 years on the average. This means that from the eponym year of Tiglath-pileser I to the eponym year of Taklāk-ana-Aššur there elapsed 7 × 2.7 + 1 × 2.7 = ca. 21 years. This result fits very well the evidence of the inscription RIMA 2, A.0.87.4.

In other words, the intercalation mechanism proposed by Koch cannot have been employed in the Assyrian calendar in the reign of Tiglath-pileser I, and the Babylonian dates recorded in the documents from his reign must have been real, rather than schematic, Babylonian dates. This conclusion is also supported by the liver omen text Assur 4530, which is dated by a Babylonian date only: "Month Tašrītu, day 11, the eponym year of Tiglath-pile[ser] (I)" ($^{\text{ITU}}$DU$_6$ UD.11.KÁM *li-mu* $^{\text{mGIŠ}}$TUKUL-*ti*-IBILA-É.[ŠÁR.RA], Assur 4530, rev. 49).[39] It stands to reason that if a scribe working in Aššur could date a text that he produced by a Babylonian date only, it was a real and not a schematic Babylonian date.[40]

3. The movement of Assyrian months through the solar year cycle from the late 13th to the late 12th century B.C.E.

Moreover, it can be demonstrated now that the practice of Assyrian calendar months moving all the way through the solar year cycle existed for at least a whole century prior to the reign of Tiglath-pileser I. The crucial evidence to this effect comes from the letter DeZ 3320,[41] discovered at Tell Šēḫ Ḫamad (ancient Dūr-Katlimmu) on the Lower Ḫabūr.[42] This letter is only partly preserved, so that the names of the sender and the addressee are broken away, but it appears that the sender was Sîn-mudammeq, a high Assyrian official active in the area of the Upper Ḫabūr and the Upper Balīḫ, and the addressee was Aššur-iddin, the Assyrian Grand Vizier and the governor of the Assyrian territories in northeastern Syria.[43] The letter is dated to day 27 of the Assyrian month Allānātu, the eponym year of Ina-Aššur-šumī-aṣbat[44] (which, as the present author has argued in an earlier study, was the 18th regnal year of Tukultī-Ninurta I, belonging thus to the last quarter of the 13th century B.C.E.).[45]

For the purposes of calendrical reconstruction, the following passage from the letter DeZ 3320 is important:

> 8') TÚG.GAD.MEŠ *ša ša-at-te an-ni-te* ⸢*e-ṣi*⸣*-du-ni* 9') 10 GÚ.UN *i-ba-áš-ši iš-tu* TÚG.GAD.MEŠ *la-áš-šu-ni* 10') *i-ga-ra-te-ma ù tar-ba-ṣa ša* TÚG *li-qa-al* 11') *lu né-pu-uš tu-ur* UD.MEŠ *i-ka-ṣu-ú* 12') *a-na ma-sa-e la-a i-lak pa-ni ṭé-mi ša* EN-*ia* 13') *a-da-gal a-na ka-ṣa-ri* EN *li-iš-pu-*⸢*ra*⸣ 14') *li-ik-ṣu-ru li-im-ḫi-ṣu* 15') *a-di* UD.MEŠ *ṭa-bu-ni li-im-si-ú*
>
> The flax harvested this year amounts to 10 talents (ca. 300 kg). When no flax remains (in storage), should (someone) take care about the walls and the enclosure (intended for storage) of flax, or should we do (it)? The days will become cold again; then it (the flax) will not be fit for washing. I am waiting for the decision of my lord. May my lord write me concerning the tying! Let them tie and crush (the flax); let them wash (it) as long as the days are fine![46]

The key verbs in this passage, denoting the activities, which had to be performed with relation to the harvested flax, are *masāʾu* (Assyrian form of *mesû* "to wash"), *kaṣāru* ("to tie, bind together") and *maḫāṣu* ("to beat").

There are several descriptions of the growing, harvesting and processing of flax, written by authors who lived in or visited the Near East from the ancient times down to the

Month(s) of the solar year cycle	Stage in the processing of flax
October-November	Sowing
March	Harvesting (pulling the stalks out of the ground)
March-April	Preliminary combing
April-June	Initial retting (in order to clean, shrink and bleach the stalks, for ca. two weeks)
(subsequently)	The stalks are dried in the open air and turned over several times
July	Crushing of the stalks with hammers
August-September	The stalks are retted in water again, for about a month
October	The stalks are crushed again with hammers and separated into fibers; the fibers are tied in bundles

Table 3. Stages in the processing of flax in pre-modern Near East, according to Aḥmad bin ʾAlī al-Maqrīzī, as summarized by Moshe Gil.

Late Middle Ages. Probably the most detailed of those is the account of Aḥmad bin ʿAlī al-Maqrīzī, an Egyptian author of the early 15th century C.E., which was recently summarized by Moshe Gil.[47] Gil's summary can be expressed in table 3.

Since the letter DeZ 3320 speaks of the need to wash the flax before the days get cold, it appears that the washing referred to is the second retting of flax described by al-Maqrīzī, which would take place in August-September (the average summer temperatures in north-eastern Syria are quite similar to those in Egypt; the colder and wetter winter in north-eastern Syria would be irrelevant for activities that would take place in the summer). This interpretation is further supported by the reference to the tying of flax, which, according to al-Maqrīzī, followed after the second retting.[48]

Now, we have seen that in the eponym year of Tiglath-pileser I (which was probably his first regnal year) the Assyrian month Ḫibur corresponded to the Babylonian month Abu—i.e., day 1 of the month Ḫibur corresponded to day 1 of the month Abu (see above, table 2). Day 1 of Abu, in turn, must have occurred four months after day 1 of the month Nisannu—the beginning point of the Babylonian year.

Assyrian records from 747–625 B.C.E.—a period when the Babylonian calendar had been long established in Assyria but the regular 19-year cycle of intercalation, known from the second half of the first millennium B.C.E., was not yet introduced—indicate that Nisannu 1 fell from 35 days before the spring equinox to 17 days after the spring equinox.[49] However, the calendrical theory accepted in Assyria during the 8th–7th centuries B.C.E. demanded the spring equinox to take place on Nisannu 15, whereas the original Babylonian calendrical theory, known from the first half of the second millennium B.C.E. onwards, demanded the spring equinox to take place on Addaru 15 (of course, these are ideal dates for the spring equinox, and in actual practice, both in Babylonia and in the first-millennium B.C.E. Assyria, the dates of the spring equinox varied due to the shifting positions of the lunar months in relation to the solar year cycle).[50] In the light of this, one is to allow for the placement of Nisannu 1 up to a month later, in relation to the spring equinox, during the second millennium B.C.E., compared to the placement of the same date reflected in the Assyrian documents of the 8th–7th centuries B.C.E. At the bottom line, it appears justified to assume that during the second millennium B.C.E., day 1 of Nisannu could occur anytime from ca. 35 days before the spring equinox to ca. 45 days after the spring equinox.[51]

During the 12th century B.C.E., the spring equinox would occur on March 31 or April 1 (Julian dates).[52] This means that day 1 of Nisannu fell in the first regnal year of Tiglath-pileser I from late February to mid-May. Day 1 of Abu must have fallen in the same year four months later—i.e., from late June to mid-September—and that was also day 1 of Ḫibur. Given the order of the months in the Assyrian calendar, day 27 of Allānātu must have occurred in the first regnal year of Tiglath-pileser I a little over five months before day 1 of Ḫibur—i.e., from late January to mid-April. This is 4–8 months earlier than the placement of Allānātu 27 as indicated by the letter DeZ 3320 (around the time proper for the second retting of harvested flax, in August-September). Consequently, it is impossible to maintain, as does Koch, that each of the Middle Assyrian months always belonged to the same season of the solar year cycle.

On the other hand, if we assume that the Assyrian months moved all the way through the solar year (10.89 days backward for each cycle of twelve Assyrian lunar months) during the whole period spanning the 13th–12th centuries B.C.E., then we can calculate the magnitude of this movement from the 18th regnal year of Tukultī-Ninurta I to the first regnal year of Tiglath-pileser I. Given the results of our recent reconstruction of the continuous chronology of the kings of Assyria based on the Assyrian King List,[53] we can calculate that from the beginning of the 18th regnal year of Tukultī-Ninurta I to the beginning of the first regnal year of Tiglath-pileser I, there elapsed 114 years (20 out of the 37 years of reign of Tukultī-Ninurta I, 4 regnal years of Aššur-nādin-apli, 6 regnal years of Aššur-nērārī III, 5 regnal years of Ellil-kudurrī-uṣur, 13 regnal years of Ninurta-apil-Ekur, 46 regnal years of Aššur-dān I, 1 regnal year of Ninurta-tukulti-Aššur, 1 regnal year of Mutakkil-Nusku, and 18 regnal years of Aššur-rēša-iši I).

The years recorded in the Assyrian King List must have been Assyrian calendar years. If the Assyrian calendar year consisted always of twelve lunar months, then, during 114 years, the discrepancy between the solar year and the Assyrian calendar year would have accrued to $114 \times 10.89 = 1241.46$ days. Since the number of 1241.46 days includes the duration of three full solar year cycles ($365.25 \times 3 = 1095.75$ days), we can express this discrepancy, in the terms of the placement of a given Assyrian calendar date within the solar year cycle, as $1241.46 - 1095.75 = 145.71$ days. In other words, in the 18th regnal year of Tukultī-Ninurta I, day 27 of the month Allānātu would occur ca. five months later, in the terms of the solar year cycle, than it occurred in the first regnal year of Tiglath-pileser I. Consequently, Allānātu 27 would occur in the 18th regnal year of Tukultī-Ninurta I between late June and mid-September. The later part of this period fits the season of the solar year cycle, in which day 27 of Allānātu must have occurred in the 18th regnal year of Tukultī-Ninurta I according to the letter DeZ 3320.

If we consider, for the sake of the argument, the mechanism of intercalation for the

Middle Assyrian calendar proposed by Weidner,[54] we will have to reckon with the existence of a 13-month year every 2.7 years, on the average, in the Middle Assyrian calendar, which would however not disturb the backward movement of the Assyrian calendar months through the solar year cycle. This means that every period of ca. 32 Assyrian calendar years would include 33 complete cycles of twelve lunar months. The 114 years that elapsed from the beginning of the 18th regnal year of Tukultī-Ninurta I to the beginning of the first regnal year of Tiglath-pileser I comprised three complete periods of 32 years; consequently, following Weidner's proposal, this period would include 114 + 3 = 117 complete cycles of twelve lunar months. The displacement of Allānātu 27 in the 18th regnal year of Tukultī-Ninurta I, compared to the first regnal year of Tiglath-pileser I, would then have to be increased by 10.89 × 3 = 32.67 days, i.e., by slightly more than a month. In this case, Allānātu 27 would occur in the 18th regnal year of Tukultī-Ninurta I between late July and mid-October. This period fits almost entirely the season of the solar year cycle, in which day 27 of Allānātu must have occurred in the 18th regnal year of Tukultī-Ninurta I according to the letter DeZ 3320.

Thus, the evidence of the letter DeZ 3320 fits both the possibility that the Middle Assyrian calendar years were purely lunar and the possibility that the mechanism of intercalation proposed by Weidner was employed in the Middle Assyrian calendar. What this evidence does not fit is the possibility that the intercalation mechanism proposed by Koch was employed in the Middle Assyrian calendar. In the light of this conclusion, and in the light of the evidence furnished by the documents from the reign of Tiglath-pileser I considered above, it is clear that the mechanism of intercalation proposed by Koch could not have been employed in the Middle Assyrian calendar in the 13th-12th centuries B.C.E.[55]

IV. Why the beginning point of the Middle Assyrian year was not confined to a single season of the solar year cycle

Now we can turn to the intercalation mechanism for the Middle Assyrian calendar proposed by Weidner. As mentioned above, this mechanism allows the movement of Assyrian months through the solar year but demands that the beginning point of the Assyrian calendar year be confined to a single season of the solar year cycle. Below, we will consider several Middle Assyrian documents, which provide evidence for establishing the beginning point of several specific years, and we will demonstrate that the evidence of these documents refutes Weidner's proposal.

1. *MARV* II 19

The first document to be considered is VAT 19193 (*MARV* II 19). This document is a table recording, month by month, for the duration of two years, the numbers of hides of different kinds of sacrificed sheep and goats. The subscript to the table records that the accounting of the hides was performed by the chief knacker Amurru-šuma-uṣur.[56] In the table itself, the record for each year begins with the month Ṣippu and ends with the month Ḫibur;[57] thereafter follows the summary record for the relevant year (followed by a double dividing line). The first year recorded in the table is the eponym year of Usāt-Marduk; the second is the eponym year of Ellil-ašarēd.[58]

From *MARV* II 19 it is clear that the eponym years of Usāt-Marduk and Ellil-ašarēd began with day 1 of the month Ṣippu and ended with the last day of the month Ḫibur. This was recognized already by Weidner,[59] who, regrettably, categorized this document with several other Middle Assyrian documents cited in an earlier study by Hans Ehelolf and Benno Landsberger as alleged evidence that a calendar year in the Middle Assyrian period could begin with any of several different months.[60] In fact, the documents cited by Ehelolf and Landsberger indicate merely that different calendar months in the Middle Assyrian period could correspond to the Babylonian month Nisannu; the assumption that the Assyrian calendar year began in a month corresponding to Nisannu cannot be justified without explicit evidence to that effect, which neither Ehelolf and Landsberger nor Weidner did provide.[61] The contribution of *MARV* II 19 is valuable precisely because it provides evidence of two Middle Assyrian calendar years beginning with the month Ṣippu regardless of the correspondences between the Assyrian and the Babylonian months.

Can we determine, in what season of the solar year cycle the first day of the month Ṣippu occurred in the eponym year of Ellil-ašarēd? This eponym belongs to the reign of Shalmaneser I, and a previous study by the present author concerning the order of the eponyms belonging to his reign has reached the conclusion that the eponym year of Ellil-ašarēd I was the 28th regnal year of Shalmaneser I.[62] Given our recent reconstruction of the continuous chronology of the kings of Assyria in the 13th–12th centuries B.C.E., based on the Assyrian King List,[63] we obtain that from the beginning of the 28th regnal year of Shalmaneser I to the beginning of the first regnal year of Tiglath-pileser I there elapsed 134 years (3 out of the 30 years of reign of Shalmaneser I, 37 regnal years of Tukultī-Ninurta I, 4 regnal years of Aššur-nādin-apli, 6 regnal years of Aššur-nērārī III, 5 regnal years of Ellil-kudurrī-uṣur, 13 regnal years of Ninurta-apil-Ekur, 46 regnal years of Aššur-dān I, 1 regnal year of Ninurta-tukulti-Aššur, 1 regnal year of Mutakkil-Nusku, and 18 regnal years of Aššur-rēša-iši I).

In section III of the present article, we have demonstrated that the Assyrian calendar months must have moved all the way through the solar year (10.89 days backward for each cycle of twelve Assyrian months). We have utilized this datum to calculate the displacement of a specific Assyrian calendar date over a given number of Assyrian years, both with regard to the possibility that the Assyrian calendar year consisted always of twelve lunar months and with regard to the possibility that the Assyrian calendar year was intercalated every 2.7 years on the average by the addition of a thirteenth month, without disturbing the backward movement of the Assyrian calendar months through the solar year, in accordance with the mechanism of intercalation proposed by Weidner. Since the present section of our article deals with Weidner's proposed mechanism of intercalation, all our calculations in this section will be based on the assumption that Weidner's proposal is correct, with the aim to demonstrate that even on this assumption, it is impossible to assign the beginning points of all Assyrian calendar years in the 13th–12th centuries B.C.E. to a single season of the solar year cycle. The sole aim of our calculations in the present section of the article is this kind of 'proof by contradiction'; therefore, those calculations will be admittedly invalid for determining the actual absolute dates of the beginning points of Middle Assyrian calendar years, once Weidner's proposed mechanism of intercalation is refuted.

According to Weidner's proposed mechanism of intercalation, every period of ca. 32 Assyrian calendar years would have included 33 complete cycles of twelve lunar months. The period of 134 Assyrian calendar years that elapsed from the beginning of the 28th regnal year of Shalmaneser I to the beginning of the first regnal year of Tiglath-pileser I