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[1] Preface

This is the second edition of this general treatise on the biblical calendar, and a third edition is anticipated. It is written for English speaking readers who have an interest in the biblical calendar, and it does not require a knowledge of any other language. It does not presuppose that the reader is already familiar with various aspects of the biblical calendar. It begins with the most basic matters and gradually fills in the details in an orderly fashion, never requiring the reader to know something that will be explained later except for some appendices. The main companion to this is a literal Bible translation and a concordance with Strong's numbers. This book is written for both Jews and non-Jews who have an interest in the biblical calendar. Since reference works are primarily written for verse numbering as found in the KJV, the verse numbering used in this book follows that of the KJV rather than the alternate numbering found in Jewish translations. When I supply a literal translation that contains the Tetragrammaton (the sacred four-letter Hebrew name of the Almighty), I will use the four capital letters YHWH as a literal method to highlight this, and the reader will have the freedom to decide what to say if it is spoken.

The Hebrew Bible, with parts of Ezra and Daniel in Aramaic, is also called the Tanak. The name "Tanak", with emphasis on the three consonants TNK, recognizes the division of this Bible into three distinct parts as preserved in Bibles printed by Jewish sources. The word "Tanak" will sometimes be used instead of the word "Scripture" or "Bible".

Some readers will already have studied the calendar from a biblical perspective and will want to know the conclusions immediately. They may turn to the chapter titled "Epilogue" near the end of this book. This epilogue is not intended to be self-explanatory as though it could stand on its own as a separate document. It assumes that the reader has already read this book and is a type of summary that emphasizes the biblical backbone for the conclusions.

The order of presenting the subject is critical to aide in logical reasoning and especially to avoid circular reasoning. I avoid writing anything that uses a result that is claimed to be proved later, because that approach can lead to circular reasoning. This principle is violated in regard to the topic of Rabbinic literature, which is a topic of considerable controversy among the

branches of modern Judaism. Rabbinic literature does discuss the calendar, but this book puts primary emphasis on the literal meaning of the Hebrew Scriptures rather than on Rabbinic literature. Yet at some occasions Rabbinic literature is of interest, and thus it is sometimes discussed with regard to its views on the calendar; this is always documented. An appendix discusses Rabbinic literature, and this is mentioned at various places in the body of this book. An appendix that is focused on a single self-contained technical topic may be read at the time it is first mentioned in the body of the text without concern that it threatens circular reasoning. Thus a later appendix is not considered to violate the concept of proceeding in a logical order without resorting to conclusions based upon what is written later. Rabbinic literature is an exception because the appendix devoted to it draws upon certain material that is discussed in the body of this book. From the viewpoint of this book, Rabbinic literature is not the basis for understanding the biblical calendar.

When studying controversial aspects of history, one must first grasp proper methods of study. The most elementary and important matter in studying history is distinguishing between primary and secondary sources. A primary source is a record of the events that is dated close to the time of the events. A secondary source is a rewriting of the available primary sources with personal reasoning, suppositions, interpretations, correlations, deletions, additions, modifications, conclusions, etc. A good secondary source will include documentation of the primary sources used so that the reader may go to those primary sources and check on the author's possible assumptions, additions, and biases. The primary sources must also be weighed for degrees of bias in them.

The meanings of certain Hebrew words in the Bible are especially significant for an understanding of the biblical calendar. Archaeological discoveries concerning ancient Semitic languages were achieved in the 19th and 20th centuries, which are important toward recovering the meanings of certain Hebrew words. One chapter is devoted to this in order to explain the reason for the importance of ancient Semitic languages.

Acknowledgements

During the years 1980 through 1982 my friend Rob Anderson caught the biblical calendar interest as well, and he volunteered to write a computer program that ran on a Hewlett-Packard HP-3000 minicomputer that would

approximate the visibility of the new crescent based upon Karl Schoch's curve. The software that he wrote was partly based upon the bibliographic reference Van Flandern and Pulkkinen. His many and varied computer studies were a significant help to understand how the astronomical circumstances for the calendar changed for the first month and the seventh month, the minimum and maximum time from the astronomical new moon to the sighting of the new crescent, the time from sunset to moonset on days that the new crescent would be seen, the date that the biblical festivals would fall based upon a calendar of simulated visibility, the relationship between the time of the new crescent and the full moon, etc. He and I discussed many aspects of the calendar in those years, and also the astronomy of the moon. Rob also made some visits to various libraries for specialized related subjects. In September 1982, using some of the tabulated results of the studies that Rob Anderson produced with his creative software, the book titled *The Calendar God Gave to Moses* became a reality. Although I wrote nearly all the words and determined the arrangement of the chapters, all of the statistical data concerning the calendar came from Rob Anderson's efforts; thus its authorship was listed as "Herb Solinsky and Rob Anderson". The present treatise will occasionally make reference to Rob Anderson, and though his work stopped in 1982, that effort still lives on in this treatise. Initially 400 copies were dispersed, but over the years several times that number were sent out. Jack Hines from Colorado Springs, Colorado and John Trescott from Anadarko, Oklahoma also sent out significant numbers of that 84-page book from 1982 over the years. Rob Anderson's use of the HP-3000 computer was no longer available, and astronomy software needed to be pursued.

This present book is not merely a revision of the 1982 study, but a giant leap forward, addressing certain areas whose surface was only scratched at that time.

In early 1995 I began to explore astronomy software for use with the personal computer. I want to thank John Mosley, the Program Supervisor at Griffith Observatory in Los Angeles. He was very kind and patient with me as he answered my questions over several telephone calls about various astronomy software packages. He had tested and reviewed many software packages for *Sky and Telescope* magazine. He advised me that LoadStar Professional was the most accurate software available for the moon with an IBM PC compatible computer, including ease of use. It does use the JPL (Jet Propulsion Laboratory) results for accuracy in the distant past. This is DOS

based rather than Windows based, and it has never been upgraded, so that its graphics is primitive compared to what is currently available. Nevertheless, its accuracy still serves my needs very adequately.

On May 4, 1995 I was very thankful that I was able to spend 30 minutes over the phone speaking with Professor Bradley E. Schaefer, who, in my opinion is the most knowledgeable person alive on technical matters relating to the visibility of the new crescent. I learned much from that phone call, and some of his publications that were helpful are listed in the bibliography. He was the first one to alert me about the need to consider humidity as a significant factor for the ability to see the new crescent.

In mid-September 1982 I had a desire to speak with Professor Otto Neugebauer about the history of the Jewish calendar from before the destruction of the Temple in 70. I telephoned the History of Mathematics department at Brown University, and he himself answered the phone!!! My desire was satisfied and I acknowledge his assistance and willingness to speak with me.

In the summer of 1992 I noticed that there was an agricultural experimental station that was labeled as an extension of Texas A & M University, located in Plano, Texas. After contacting this facility by telephone, I was transferred to Professor David Marshall, who is a grain geneticist, specializing in wheat and barley. He invited me to visit him at his office, and I happily accepted for the purpose of learning more about barley, including how and when it ripens. I was mentally sky high as he loaned me a tall pile of his personal books about barley and grains. He told me that I should look into the genetics of barley because different varieties ripen at different times. I followed his advice, and two months later I spent nearly three days at the library of Texas A & M University in College Station. I am grateful to David Marshall.

In November 1997 I received a telephone call from Jack Hines explaining the need to make computer projections of the dates of the biblical festivals through the year 2010. At his suggestion he and I agreed to independently use different software to apply Karl Schoch's curve and then compare dates and reconcile differences in order to reach agreement. We did this, but in the process of reconciling differences and discussing the options in the software that he was using, I learned more about the meanings of certain astronomical

coordinate systems. I thank Jack Hines for his useful suggestions, his participation, and his encouragement.

Useful discussions transpired with Wayne Atchison, Phil Frankford, Ralph Lyman, Steve Rathkopf, and Jim Sorenson.

[2] Goals of this Study and the applied Philosophy to attain these Goals

There are two broad and primary goals of this study. The first is to discover the nature of the calendar that was used by ancient Israel, i. e., the biblical calendar. The second is to expound a procedure that may be applied in today's society by which this calendar (*or one especially "close" to it*) may be used.

The modern calculated Jewish calendar will be abbreviated MCJC. If one considers it worthwhile to replace the MCJC with another calendar, that would only make sense if the proposed replacement was based upon the same principles as the calendar used by ancient Israel, i. e., the biblical calendar. The second requirement for replacing the MCJC is to expound a procedure that may be applied in today's society by which this calendar may be used.

It is important to have a clear stated philosophy with the guiding principles that are to be used to develop a procedure to apply the calendar that was used by ancient Israel. The philosophy used in this study is now presented in the order of the priority of the philosophical principles.

(A) The Biblical Model. If the same illustrative astronomical positions and other conditions that occur today were also to have prevailed in ancient times, the decision or conclusion to be determined today should agree as much as possible with the ancient decision in Israel relating to the calendar. The MCJC is weak in this respect, especially because the principles in its calculation do not closely approximate the consistent reality of astronomy. If this biblical model is not given the highest priority in the calendric procedure, then the procedure will be open to the same criticism as the MCJC and will have no advantage over the MCJC.

(B) Avoiding Arbitrary Rules. The proposed procedure should embody a minimum number of subjective rules with an arbitrary decision. The MCJC is weak in this respect because there are many arbitrary rules related to the

calculation as well as to the final decision. If this point is violated, then the proposed procedure is justly open to the criticism that it is a relatively fictitious calendar, i. e., it has modern invented rules, and is therefore inherently no better than the MCJC. The criticism of adopting a fictional calendar having subjective and arbitrary rules is a serious one.

(C) **Spiritual Unity.** The proposed procedure should resolve disputes over the date for the festivals in any area of the world, so that if people desire to attend a festival together, then they should arrive at the same date for the holy convocations. This does not require or imply organizational unity of those in attendance; instead, it implies spiritual unity that crosses organizational boundaries. Spiritual unity does not imply doctrinal unity on nearly all subjects, but it does imply a spirit of peace with the ability to accept people whose viewpoints do not always agree with yours. While it is possible for people to meet together for a festival of tabernacles for which all of their dates only agree upon six of the eight days, that is far from ideal because there is a loss of 25 percent of the feast in full togetherness. Even if some people plan to stay extra days beyond those that they personally consider to be holy convocations, they are likely to avoid certain group activities that conflict with their dates of holy convocation.

There is much in Scripture to support spiritual unity, and at the appropriate place this will be discussed in some detail.

[3] Cognate Words in Ancient Semitic Languages to aid Hebrew

The Bible is the ancient texts of Scripture in its original languages. But unless we can know the ancient meanings of all the words and expressions found in these ancient texts of Scripture, our understanding of the Bible will have limitations. Let us consider how the Hebrew language came to be the language of the Hebrew Scriptures, the Tanak.

About 1900 BCE Abraham left Ur of the Chaldeans to go to the land of Canaan (Gen 11:31; 15:7). This area was about 450 miles northeast of Jerusalem. Gary Rendsburg wrote on page 116 "... Abraham's Ur should be identified with modern Urfa in southern Turkey (near Harran), which not only accords with local Jewish and Muslim tradition, but truly is 'beyond the River,' to use the biblical expression [Josh 24:2]." Maps in most Bibles do not show Ur near Harran where it ought to be. Ur is in a region for which Akkadian was the ancient Semitic language. Abraham, Lot, and their

servants with their families brought this primary language of the Middle East with them, but Isaac, Jacob, and his sons' families lived in Canaan where they were a tiny minority in the midst of the Canaanites who did not speak Akkadian. In order to converse with their more numerous neighbors, these descendants of the original group with Abraham had to learn the local language of the Canaanites, and over time it should be expected that their use of Akkadian gradually died out because it was impractical in that environment. Roughly 500 years after Abraham's time, Joshua led the Israelites back into the land of Canaan after their captivity in Egypt. It is not known how much of the language of Canaan they retained during their generations in Egypt, but once they entered the Promised Land, their continuing contact with the native peoples led to further merging of the language of the Israelites with that of the Canaanites. In the review by Galia Hataf, on page 131 we read, "Saenz-Badillos provides a full survey of the history of the Hebrew language, tracing its origins in the Canaanite period, through a span of 3,000 years, including its modern use in Israel." Saenz-Badillos wrote, on page 53, "From the moment of its appearance in a documented written form, Hebrew offers, as we saw in the previous chapter, clear evidence that it belongs to the Canaanite group of languages, with certain peculiarities of its own."

On page 12 of the book by Cyrus Gordon there is a discussion about the ancient city of Ugarit on the eastern coast of the Mediterranean Sea to the north of ancient Israel. This was the capital of the small Ugaritic Kingdom, which flourished from about 1400 to 1200 BCE during the time period of the Judges in Israel. This page states, "Ugarit itself was located near the northwest corner of what we may call Canaan, the land that nurtured a number of linguistically related groups including the Phoenicians and the Hebrews."

The discovery of the first texts in the Ugaritic language in 1929 is described on page 14 of the book by Mark Smith. On page 15 he mentions that in 1930 a few scholars had assigned certain shaped letters in these texts to equivalent letters in ancient Hebrew. These letter assignments were made based upon the initial assumption that the Ugaritic language was very similar to ancient Hebrew. Once this decipherment was made, the Ugaritic language was easily understood by scholars who knew Hebrew.

While there are some differences in grammar between Ugaritic and ancient Hebrew, these Semitic languages are very closely related. In 1930 a

significant library of Ugaritic texts was discovered in the Ugaritic Kingdom. The northern boundary of the ancient Canaanites is unknown, so that leading scholars of Ugaritic studies at the end of the twentieth century are no longer willing to state that the Canaanites spoke the language that is called Ugaritic, but it was surely very close to it, as was biblical Hebrew. On page 1 of the Ugaritic grammar book by Daniel Sivan, he mentions that over 1300 texts have been unearthed from this greater region. He wrote, “At the present time, these clay tablets represent the only substantial second millennium B. C. E. source wholly written in the language of the inhabitants of the greater Syria-Israel region.” On pages 2-3 he wrote that a few scholars hold the view that Ugaritic is a Canaanite dialect, but others maintain that it is an independent language quite distinct from Canaanite. On page 4 Sivan wrote, “Ever since the discovery of the Ugaritic writings many studies have been written concerning the expressions of style and of form that are common to Ugaritic and Biblical Hebrew literature both in larger literary units and isolated refrains.” Later, on the same page we note, “The profound connection between the two literatures serves to elucidate many difficult passages in the Bible on [the] one hand and points to a common stylistic stock on the other.”

On pages 224-225 of the book by Mark Smith, he wrote, “In retrospect, the Ugaritic texts have fulfilled their promise for biblical studies. No other corpus from Syria to Mesopotamia, no roughly contemporary corpus such as the Mari texts, the El-Amarna letters, or the Emar texts (though these still hold considerable promise!), or even later texts such as the Dead Sea Scrolls, have made the same impact on the understanding of Israel's languages and culture.”

Certain words found in biblical Hebrew have a meaning that is not clearly determined from the biblical contexts. Some of these words have a cognate in the Ugaritic language or in another Semitic language. By a cognate, I mean a word that sounds almost the same in the other language, is spelled almost the same using equivalent letters, is used in similar contexts, and which seems to have a common linguistic ancestry. Additional contexts of the cognate in the other Semitic language often provide clarifications or more precise meanings of some Hebrew words.

In his discussion of Hebrew lexicons, on page 201, Michael O'Conner wrote, “The most important change between them [both the first edition of the Koehler-Baumgartner Hebrew lexicon in 1953 and Zorell's Hebrew lexicon

of 1954] and Buhl [his revision of Gesenius' Hebrew lexicon in 1915] was the discovery of Ugaritic [in 1929]: this is well represented in Koehler-Baumgartner 1 and almost not at all in Zorell.” If grammatical care and most especially contextual matching is not followed, then the use of allegedly cognate words to transfer meanings can lead to wild speculations, and some irresponsible scholars have thereby given a foul taste to the use of Ugaritic in biblical studies; see pages 159-166 of the book by Mark Smith who especially points to the abuses of Mitchell Dahood in damaging the reputation of the use of Semitic cognates. Michael O'Conner comments on this negativity as follows on page 203, “It may be that the [irresponsible] excesses of G. R. Driver and Mitchell Dahood are to be blamed for the negative view often taken nowadays of comparative [Semitic] argumentation, but the neglect of such argumentation has had a deleterious effect.” In other words, abuses of the use of Semitic cognates has led some scholars to want to abandon its use altogether, and this abandonment has been harmful, especially if grammatical care and good contextual matching is achieved.

Another ancient nation on the eastern coast of the Mediterranean Sea and north of Israel is Phoenicia whose language is called Phoenician. As mentioned above in the quotation from the book by Cyrus Gordon, Phoenician was also similar to ancient Hebrew. On pages 58 and 60 of the book by Edward Lipinski, he wrote, “Phoenician is the Canaanite form of speech used in the first millennium B.C. in the coastal cities of Byblos, Sidon, Tyre, in the neighboring towns, and in the various settlements and colonies established in Anatolia, along the Mediterranean shores, and on the Atlantic coast of Spain and of Morocco.”

The language of the Phoenician colonies is called the Punic language, which is also very similar to Hebrew. Later, Aramaic became the language of the Mesopotamian region, but Aramaic was originally an eastern Mesopotamian Semitic language that also has many affinities to Hebrew. Syriac is a later offshoot of Aramaic. The common ancient Semitic languages that are closest to biblical Hebrew in order of closeness are the group of Ugaritic, Phoenician, and Punic, followed by Aramaic, Syriac, and Akkadian. Arabic is another Semitic language that is less close to biblical Hebrew.

The Israelites began their use of Hebrew in the land of Canaan where they derived their language. It was directly north of this area that Ugaritic and Phoenician were spoken. The deities of the Canaanites as mentioned in the

Bible, namely Baal and Dagon, are also discussed in Ugaritic along with pagan practices associated with those deities, so the religion of the Ugaritic Kingdom and the religion of the Canaanites must have been very similar. Cognate words in these languages that are embedded in similar contexts and are not used in an idiomatic expression should have virtually the same meanings. The ancient Israelites adopted the vocabulary of this region in their language.

Comments concerning whether etymology is useful are now addressed because I have seen some individuals come to unwarranted conclusions from the application of etymology. The supposed first or early use of a word is its etymology. On page 148 of his linguistic discussion, Peter Cotterell wrote, “The myth of point meaning. The first is *the myth of point meaning* - the supposition that even if a word has a range of possible meanings attested in the dictionary, there lies behind them all a single ‘basic’ meaning.” Then on page 149 he wrote, “The etymological fallacy. The myth of point meaning is closely related to *the etymological fallacy*. Words represent dynamic phenomena, their possible range of associated referents constantly changing, and changing unpredictably.” On page 150 he wrote, “Thus, the meaning of a word will not be revealed by consideration of its etymology but by a consideration of all possible meanings of that word known to have been available at the time the word was used (thus avoiding the diachronic fallacy [the meaning may change over time]), and of the text, cotext, and context within which it appears. Even then it is necessary to be aware that an individual source may make use of any available symbol in any arbitrary manner provided only that the meaning would be reasonably transparent *to the intended receivers*.” Later on this page the author continues, “The fact is that the etymology of a word *may* help to suggest a possible meaning in a particular text. But it is the context that is determinative and not the etymology.” Even comparative Semitic cognates are useless if the contexts of the cognates are not the same.

The KJV was published in England in 1611 at a time after that nation had rejected the authority of the Roman Catholic Church and replaced it with its national church, the Anglican Church. However, there was some religious tolerance in England, especially for the Jews. Gesenius wrote his famous Hebrew lexicon before the middle of the nineteenth century, and he often used the meanings of ancient Arabic, Aramaic, and Syriac words to explain some Hebrew words. Thus Gesenius employed Semitic cognates to help understand biblical Hebrew, yet he did so in a responsible manner of

matching the context. But after his death newer archaeological discoveries written in ancient Akkadian, Ugaritic, Phoenician, and Punic have been made, and thus many useful papers, lexicons, and commentaries have been written since the middle of the twentieth century that help explain certain Hebrew words and phrases. This is called the use of comparative Semitic languages applied to biblical Hebrew.

The Hebrew Scriptures were written over a period of hundreds of years in an ancient culture. The reader who wishes to study the Scriptures in solitary confinement with nothing but an English translation of the Bible will be disappointed because some of the Hebrew words are only now being capable of comprehension in its original context through archaeology, history, comparative Semitic languages, etc. There is no single source to acquire that will provide all data that one needs to fully understand the latest attainable knowledge about ancient Hebrew. Strong's concordance is outdated in the scholarship of its lexicons, which were prepared by volunteer students. Many of its etymologies are conjectural and misleading. Etymology itself, even if correct, is often not a reasonable guide to discover the meaning of a Hebrew word. In general, etymology, especially when it is often a guess, is not a good method to use to arrive at the meaning of a Hebrew word that is not easily attained from its biblical contexts.

When journal articles discuss the meaning of a Hebrew word, they never refer to the Hebrew lexicon at the back of Strong's concordance because its lack of authority and care is well recognized in scholarly circles. The claims in Strong's concordance that word xxxx was etymologically derived from word yyyy are generally mere conjecture and should not be repeated. The only time I ever look at the lexicons at the back of Strong's concordance is to check that another writer has correctly quoted from it. But the word numbers in Strong's concordance are a very useful method for identifying the words for English speaking people for whom this is being written. Most Hebrew words do have stems, which are from two to four letters within the word.

I will provide literal translations of many Scriptures. For some significant words I will supply the Strong's number and often provide a transliteration of the Hebrew word in its standard singular form (for non-verbs) or its infinitive form (for verbs). Sometimes I will put the Strong's number and the transliteration in square brackets immediately after the English word. Authors, editors, and other sources that are used are cited in full in the bibliography at the end. The English letter spellings that are used within

Strong's concordance to transliterate the Hebrew words are most often contrary to all of the three Jewish schools of pronunciation (Ashkenazic, Sephardic, and Yemenite). Hence I will not use the spellings in Strong's concordance.

[4] Disguised Confusing Footnote in the Brown-Driver-Briggs Lexicon

The original BDB Hebrew lexicon was first published in 1907 by Oxford University Press. In 1979 this was reprinted by Hendrickson Publishers, who added Strong's numbers to the Hebrew words, but kept the text and the page numbers the same. The 1979 edition also added a useful appendix with Strong's numbers at the end. Long after this lexicon was completed in 1907, some important discoveries about some biblical Hebrew words have been made utilizing comparative Semitic languages, especially derived from excavations of Ugaritic writings north of Israel and the Dead Sea Scrolls south of Jerusalem. These discoveries affect the meanings of some Hebrew words. Nevertheless, for most words BDB remains an especially complete and useful reference work.

Sometime after the original 1907 edition was printed, the original publisher added a final chapter on pages 1119-1127 titled, "Addenda et Corrigenda", which is a list of further notes and corrections. When Hendrickson Publishers decided to reprint BDB in 1979, instead of leaving this final chapter at the end, they took each entry and *attempted* to place it as a footnote on the same page as the word to which it adds or corrects. Unfortunately, in some rare instances, the added note from the final chapter was too long to fully fit as a footnote on the same page as the original word, so that it was continued onto the next page without a clear warning near the bottom of the continuation page. This has deceived some sincere people on the continuation page for a critical Hebrew word concerning the calendar.

The Hebrew word *chodesh*, having Strong's number 2320, is discussed on pages 294-295 of BDB, and is given the translation "new moon" or "month". At the bottom of page 294 there is a difference between all printings from Oxford University Press compared to the 1979 edition. The 1979 edition has four extra lines at the bottom of the page, and some people have been led astray by not realizing that these four lines are the continuation of a footnote from the bottom of page 293 for the Hebrew verb *chadar*, having Strong's number 2314. Therefore, these four lines have nothing to do with *chodesh*, and they appear as a disguised confusing

footnote. Part of this footnote says, “conceal behind curtain, conceal, confine”, and this gives the false impression that *chodesh* refers to the condition of the moon when it cannot be seen. In the chapter of “Addenda et Corrigena” in the later reprints by Oxford University Press, this long note for *chadar* appears in the middle of column 1 on page 1123 where it specifies that it refers to the Hebrew word *chadar* from page 293. BDB makes no implication at all concerning the appearance of the moon at the “new moon”. The new moon will be discussed below where it seems most appropriate.

[5] Introduction to Ancient Calendars and Ancient Astronomy

In modern times much has been discovered about ancient calendars generally, especially with the help of applying the computer and astronomy software to ancient records in order to sift out conjecture from fact. During the 20th century many volumes of ancient astronomical records were translated and published. These have been studied in detail, and an improved history of ancient mathematical astronomy has been erected, especially since the Akkadian language of Assyria and of the priests of Babylonia was first deciphered in the late 1800's and archaeological discoveries were translated. It is unfortunate that such information is not readily available in every small-town library or on the Internet without cost. Recent research is copyrighted and may not be legally reproduced on the Internet for free or without permission. Thus the person who desires to study such matters today is very greatly handicapped by either living far away from research libraries, or even when only 50 miles away, a major effort must be made to fight one's way through congested traffic many times over a period of years to become familiar with the available literature. Sometimes an innocent unsuspecting person may come to a premature conclusion about the biblical calendar and then writes with conviction, thus leading other innocent ones into conclusions that would not stand up among learned people. Other people are not so innocent because they have a bias against all ideas contrary to the modern calculated Jewish calendar. Such bias often leads those to throw dust and smoke into the air and attempt to cause confusion among others who really seek genuine biblical understanding.

Since the calendar is linked to the astronomy of the sun, earth, and moon, it is important to discuss this early to define certain technical terms and to ensure that irrational and erroneous thoughts about astronomy are avoided.

[6] Ellipses and Orbits of Heavenly Bodies

The path that one heavenly body takes as it goes around another heavenly body is called its orbit. Ancient peoples did not know that the planets orbited the sun. Instead they thought that all the heavenly bodies circled around the earth. There was only one ancient Greek astronomer who went against his contemporaries by espousing his theory that the "wandering stars and the earth" (the planets) circled the sun, namely Aristarchus of Samos c. 280 BCE (see pages 74-75 of Toomer 1996). The only other ancient astronomer who is known to have accepted this sun-centered viewpoint is Seleucus of Babylon c. 150 BCE (see page 391 of Pedersen 1993 and page 247 of Stahl).

When discussing history, it is always best to quote from the original historical sources or translations of them (these are called primary sources), and then arrive at conclusions. Unfortunately, when the history of ancient astronomy is the topic, problems are encountered that prohibit quoting from original sources before Ptolemy (c. 150 CE). One insurmountable problem is that the important ancient astronomical texts are not written for the purpose of teaching others their methods; there are no ancient textbooks. Instead we find columns or tables of numbers with some occasional notes, and there are records of observations with some notes. The ingenuity of modern historians of mathematics and astronomy has enabled them to determine the meanings of the various columns and the meanings of the scientific terms used. Modern science has reverse engineered the ancient texts to learn what must have been their ancient methods in order for the columns of numbers and the occasional notes to make sense. While English translations of ancient astronomical texts certainly exist, there would be no benefit to quote from any one text for an understanding of the underlying methods unless one were writing a detailed textbook which required some significant knowledge of mathematics and astronomy. This difficulty in not being able to quote from the primary sources pertaining to ancient astronomy for the layman makes it necessary to quote and cite modern secondary sources.

For the history of astronomy the original ancient sources are so obscure that a correct interpretation requires great care by specialists in this field, so that scholars who are only historians or only modern astronomers may easily go astray in their conclusions. A generic example of the obscurity is a writing tablet with orderly columns of numbers having some symbol at the top of each column and some miscellaneous remarks. First, one translates the numbers into today's numbers, and also translates the miscellaneous

remarks. Second, one determines patterns to the numbers and relates these patterns to known values relating to astronomical time periods of heavenly bodies. Some columns become reasonably easy to interpret or explain, while other columns may remain a matter of modern scholarly debate for 100 years or more because the tablets themselves do not define the meaning of the columns. Simply publishing a literal translation of the tablet does not do the layman any good at all.

Because of this, when some scholar publishes a paper about the history of ancient astronomy, it may require some years of scholarly debate in order that a clear mutual understanding of the correctness of that paper will emerge. During the twentieth century some papers were published in this subject that were subsequently proven false by the best scholars in this field. But less knowledgeable writers on the history of science thought that some of these papers were correct before they were proven false, and thus popular published articles, Internet website articles, and books on the history of ancient astronomy are available with information that modern specialists in this field know to be false. Unless a person devotes some years of study to the literature on this subject and keeps up with the latest journals and advanced books related to the history of ancient astronomy, it is easy to be led astray. I have performed Internet searches and have been greatly dismayed at the widespread misinformation available. I have taken great care to learn who the best authorities are in this field, and I have only used internationally respected specialists for my quotations and sources. I have kept up with the latest literature for the specific details that are especially significant for this study.

Educated people of today know that the earth rotates on its axis once each 24-hour day, but we still speak of the sun rising up in the morning rather than the earth rotating to enable us to see the sun. Thus the sun does not really move fast around the earth so as to truly rise in the morning, but the expressions in our language, which have been handed down to us since ancient times have remained. The NKJV states in Eccl 1:5, “The sun also rises, and the sun goes down, And hastens to the place where it arose”. Nothing is improper here by saying what appears to happen from the perspective of an observer on earth. Gen 1:14 mentions the dividing of the daytime from the night, and it says that the lights in the heavens have this purpose. We must not be critical of the Bible here on the grounds that the rotation of the earth on its axis would be explained as the cause today.

Regardless of the physics, the Bible was written in terms of human perception from the surface of the earth and must be accepted this way.

The Bible gives no hint of advanced mathematical or astronomical knowledge from the days of Moses. Ancient people thought that the sun went around the earth in an orbit having the shape of a circle, and that the moon went around the earth in an orbit having the shape of a circle. Ancient Greek astronomers used the mathematics of circles to approximate the predictions of eclipses and other astronomical events, but they had to add some complexity to their mathematical schemes because they eventually discovered that the speed of the moon around the earth was not constant. They modified their mathematics in an attempt to make their predictions agree with what they observed later, yet they continued to accept circular motion of the heavenly bodies.

The German astronomer Johannes Kepler (1571-1630) discovered that the orbit of Mars around the sun had the shape of an ellipse. Sir Isaac Newton (1642-1727) proved that all planets of our solar system had an orbit around the sun shaped as an ellipse. Ancient predictions could never become extremely accurate compared to what was achieved by Newton because ancient astronomers did not truly understand the laws of motion, the shape of orbits, the physical reality of what was primarily moving, and the higher mathematics needed to prove the more precise physical relationships through time. Kepler was innovative and brilliant in using geometry to derive his results about Mars, but without having the calculus that Newton was the first to apply to astronomy, Kepler was greatly handicapped to go beyond his great achievements. But Kepler had at his disposal the very carefully documented results of many years of fine observations by Tycho Brahe, who used accurate carefully constructed mechanical astronomical instruments, and Brahe was funded by willing donors who were not concerned that the effort was not useful to people at that time. Kepler stood upon the shoulders of Brahe. Newton said that his achievements were only possible because he stood upon the shoulders of giants. The inventions of the telescope and the pendulum clock were a great help to astronomers who gave accurate data to Newton. The invention of the printing press helped to spread scientific achievements far and wide so that brilliant minds in diverse places could rapidly feed upon each other's results. The funding of European universities and the exchange of knowledge among people in a variety of scientific disciplines that was characteristic of the renaissance helped to make this achievement possible. The ancient world lacked such a critical mass of

diverse inventions and published scientific papers that teamed together to enable such magnificent results. A key word of this paragraph is *ellipse*. A few remarks about the nature of an ellipse may be useful in order for the reader to appreciate certain later comments concerning the moon's orbit around the earth. If the reader does not understand some of the discussion in the next few paragraphs, it is of no great consequence.

Picture a circular white pancake resting on a dark tabletop and consider looking at it from directly above. Its boundary looks like a circle. Then picture yourself standing upright on the floor a short distance from the table while looking at the pancake. If the height of the table is only the size of your big toe, the boundary of the pancake will look very much like a circle, but if the height of the table is only a little below the height of your eyes, the boundary will look like a very squashed circle. At some in between height, the boundary will look somewhat like an egg. Each boundary shape of the circular pancake viewed from a very low height to one near the height of your eyes is technically called an ellipse in mathematical terminology.

The orbit of the earth around the sun is nearly a perfect ellipse that is somewhat close to being a circle. The orbit of the moon around the earth is nearly a perfect ellipse that is a little less circular. If the moon and the planets did not have gravitational relationship with the earth, then the earth's orbit would be as perfect an ellipse as one could expect for a physical object. If the sun and the planets away from the earth did not attract the moon, then the moon's orbit around the earth would be a nearly perfect ellipse. However, in a technical sense the last sentence is not quite true because if the sun continues to pull at the earth and would no longer pull on the moon, the moon would fly off away from the earth because the annual orbit of the moon around the sun is based on the sun's pull on the moon, not the earth's pull on the moon.

The position of the sun within the earth's orbital ellipse and the position of the earth within the moon's orbital ellipse are not at the center where one might expect. The following will explain where they are. Picture a straight stick nailed to the center of an ellipse, and picture the length of the stick to only extend from one edge of the ellipse to the other. Now imagine hitting the stick so that it spins around the ellipse, but imagine the length of the stick stretching and shrinking as it turns, so that it always only extends from one edge of the ellipse to the other. The major axis of the ellipse is the stick's line segment when it is longest in its spin, and the minor axis of the ellipse is

the stick's line segment when it is shortest in its spin. These axes are perpendicular to one another and cross at the center of the ellipse.

Picture a stick in the position of the major axis, but imagine it to be broken at the center of the ellipse with its two halves loosely glued together so that it may change angle where the glue holds them. Now imagine putting the palm of each of your hands at the ends of the stick and slowly pushing them together as when beginning to clap hands. The clapping movement should be toward the center of the ellipse so that as both hands move at the same speed, the stick rests in the plane of the ellipse, and the glued spot moves up the minor axis. Stop the movement when the glue touches one end of the minor axis. The two ends of the stick at your palms lie along the major axis, and the two halves of the stick are joined at one end of the minor axis. Now each end at a palm is at a point called a focus of the ellipse. Each ellipse has two foci, both of which are on the major axis and off the minor axis. The procedure described shows that the distance from each focus to an end of the minor axis equals half the length of the major axis. There is only one point on an ellipse closest to a focus; that is the nearer of the two points at the ends of the major axis. Similarly, there is only one point on an ellipse furthest from a focus; that is the further of the two points at the ends of the major axis.

The sun is at a focus of the earth's orbital ellipse. The earth is at a focus of the moon's orbital ellipse. Thus the sun is never at the center of the earth's orbit and the earth is never at the center of the moon's orbit.

[7] Astronomical New Moon (Conjunction) and Full Moon

From the viewpoint of an observer on the earth far away from the north and south poles, the moon has periodically changing appearances. Typical appearances of the moon's cycle may be described as (1) the widening crescent, (2) the moon increasing toward full circle, (3) the full circle, (4) the moon decreasing away from full circle, (5) the narrowing crescent, and (6) invisibility. The *astronomical new moon* (as recognized by modern astronomers) is the moment in time (or the moon's position) in each cycle of the moon around the earth at which the center of the moon is closest to the straight line between the sun and the earth. The astronomical new moon is also called the *conjunction* of the sun and the moon as observed from a person on the surface of the earth.

A *solar eclipse* is the covering of the sun by the moon as seen by an observer on the earth when the moon comes between the sun and the earth. Such an eclipse is called *total eclipse* when the circle of the moon lies inside the circle of the sun. A solar eclipse can only occur during the time of the conjunction. How dark is it during a solar eclipse, and how long does a solar eclipse last? On pages 198-199 of Zirker we read, "During a total eclipse, however, the corona [the sun's disk] is only as bright as the full moon." On page 30 we read, "The maximum diameter difference is 2'38" and the maximum duration of totality is 7 minutes and 40 seconds for an observer near the equator. The 1973 eclipse in West Africa came very close to this maximum theoretical totality. On the average, a total eclipse only lasts for two or three minutes and seems much shorter."

Chapter 12 of Zirker's book is titled "The Great Hawaiian Eclipse" where Zirker describes the famous total eclipse over the Hawaiian Islands on July 11, 1991, which is significant because of the world famous observatory on Mauna Kea at 13,700 feet above sea level, which provided superb scientific facilities for observation. This total eclipse lasted 4 minutes 11 seconds (page 197). Page 197 states, "Schoolchildren [on Hawaii] were equipped with dark slides to view the eclipse and preparations were made to bus them to favorable locations." The reason that they look through special dark slides is so that their eyes are not damaged due to the harmful rays of the sun. During the 4 minutes 11 seconds of totality of the solar eclipse, one's eyes should not be damaged because the brightness is near that of the full moon, but outside that narrow window of time, one's eyes surely will be damaged when the moon only partially blocks the sun.

The following definitions are relative to a place on the earth significantly away from the north and south poles. The *crescent period* of the moon's cycle is the time after the three-quarter-size moon and before the following one-quarter-size moon excluding the time during which the moon is invisible and the time at which there may be a solar eclipse. The moon is called a crescent during the crescent period. The *old crescent* is the moon during the time that it is visible, assuming the atmosphere is clear, on the last day that it is visible prior to the astronomical new moon. The old crescent is seen looking east in the morning. The *new crescent* is the moon during the time that it is visible, assuming the atmosphere is clear, on the first day that it is visible after the astronomical new moon. The new crescent is seen looking west in the evening. The new crescent is sometimes called a young crescent.

Bartel Leendert van der Waerden (1903-1996) was an internationally prominent scholar in the fields of mathematics and the history of ancient astronomy. On page 169 of van der Waerden 1960, he wrote: “The difference between the first days of an exact month [month starting with and ending with the conjunction] and an observed lunar month [month starting with and ending with the new crescent] is one or two days, or in exceptional cases three days.”

On page 66 of Beaulieu we find, “In ancient Babylonia the day was reckoned from one sunset to the next. The monthly count was based on lunar phases, with the month beginning after sunset when the new crescent of the moon was seen again in the western horizon. This happened at the earliest one day, and at the latest three days after conjunction.”

At the end of the above sentence is “2” (footnote) which states the following (same page, square bracket comments are in the journal, not from me), “That the moon never disappeared for more than three days following conjunction was evidently known to Assyrian and Babylonian astronomers, as shown in H. Hunger, *Astrological Reports to Assyrian Kings* (SAA 8, 1992), text 346, a report sent by the scholar Asaredu the younger: ‘On this 30th day [the moon became visible]. The lord of kings will say: “Is [the sign?] not affected?” The moon disappeared on the 27th; the 28th and the 29th it stayed inside the sky, and was seen on the 30th; when else should it have been seen? It should stay in the sky less than 4 days, it never stayed 4 days.’”

On page 87 Beaulieu wrote: “Even after the 6th century B.C., when Babylonian astronomers developed the mathematical schemes which enabled them to calculate month-lengths in advance, it is probable that observation remained the sole authoritative way of fixing the beginning of the month.” Page 244 of Britton 1999 indicates that the Babylonian method for predicting the sighting of the new crescent is likely to have originated within the years 457-419 BCE. The Babylonian calculation for the sighting of the new crescent is based upon approximate repeating sequences of data over long periods of time. Existing records of some of the data that are used in these patterns go back to 568 BCE, which is 18 years after Solomon's temple was destroyed in 586 BCE., and the earliest archaeological source that has all astronomical parameters that are needed for the prediction of the sighting of the new crescent is dated 373 BCE (see page 197 of Hunger and Pingree). Thus the time at which the Babylonians developed methods to

approximately determine the day of the new crescent is about 450 BCE. Perhaps about 400 BCE their method was actively being used. I have not seen any published papers that attempt to quantify how accurately the Babylonian methods predicted the new crescent.

Based upon data showing that one factor of considerable significance to the Babylonians is predicting the time from when the sun sets below the western horizon to the time when the moon sets below the western horizon during the crescent phase (although other time based factors were also sought by the Babylonians), and knowing that this method has some degree of reliability toward predicting the visibility of the new crescent (but is far from a perfect method), my estimated guess is that their predictions for the new crescent were correct between 80 and 85 percent of the time when the weather was clear.

Today we speak of the conjunction and we define it in terms of the three dimensional geometry of the sun-earth-moon system and the language of orbits. But ancient people did not have our modern concept of a sun centered solar system (except for two known ancient astronomers who were ridiculed), and to the best of our knowledge today, ancient people did not have our three dimensional model of the sun-earth-moon system. We must realize that the ancient concept of the conjunction and our modern concept are different. They could see a solar eclipse, and whenever there was a solar eclipse, there was necessarily a conjunction also. But that was the only kind of conjunction they could see. What concept could they have for the conjunction generally if they could not see it? Page 110 of Koch-Westenholz states, "The Babylonians seem never to have given an astronomical explanation of eclipses." Page 101 of Koch-Westenholz states, "I know of no Babylonian astronomical explanation of the phases of the moon, ..." The Babylonians did notice the obvious fact that when the full moon occurs the moon and sun are at opposite ends of the sky, and during the symmetrically opposite time of the lunar cycle the moon and sun are traveling along side by side. A translation of an ancient Babylonian text that discusses the moon's cycle of disappearance is on page 101 of Koch-Westenholz, where "you" refers to the moon: "On the day of disappearance, approach the path of the sun so that [on the thirtieth day (?)], you shall be in conjunction, you shall be the sun's companion." Here the author's translation "conjunction" does not require that it refer to an instant in time. It is merely the time that the sun and moon are companions, traveling together.

With clear weather the Babylonians knew there could be one, two, or three nights of invisibility of the moon (as mentioned above from van der Waerden and from Beaulieu). At the moment of true conjunction the moon and sun can be at most 5.2 degrees apart from a point on the earth's surface. At this narrow an angle if the sun is in view or very near the horizon, the light from the sun will be too brilliant for the moon to be seen directly or even indirectly (the latter is called earthshine). *Earthshine* is the light from the sun to the earth, which then reflects back to the moon and then reflects to the observer on earth. Thus earthshine is the light seen from a double reflection. It is usually easy to see earthshine as the completion of the moon's circle as a faint grayish blue with the crescent at one edge on the second day old crescent. Often earthshine may be seen on the day of the new crescent if it is not a very narrow crescent. Neither modern nor ancient people could see earthshine at the time of conjunction because the sun's brilliance is too close to the moon, and this has nothing to do with air pollution.

When the conjunction occurs, the moon is invisible except during a rare solar eclipse when the moon covers the sun from view from observers in a certain region on the earth for at most 7 minutes and 40 seconds (see the quote from Zirker above). Without knowledgeable calculations, it is not possible to accurately determine the time of the conjunction. Because the conjunction is not visible except during a rare solar eclipse, ancient people who did manage to arrive at some mental concept of the conjunction (such as the time period when the sun and moon are traveling together) and who also desired to achieve a mathematical computation to predict the time of the conjunction, would only be able to check the accuracy of their mathematical prediction during the rare occasion of a solar eclipse where they were located. The strong desire of certain ancient peoples, specifically the Chinese, the Babylonians, and the Greeks, to be able to predict solar eclipses, along with a knowledge of the mathematics that enabled them to make this approximation led to their interest in the conjunction as the approximate time when the sun and moon were traveling together.

Historical records of eclipses over a long period of time will suggest cycles of repetition of eclipses, and this may be simply described as a “bookkeeping” method to predict eclipses. In the book on ancient eclipse predictions by John Steele 2000, he discusses Chinese eclipse predictions on pages 175-215. On page 177 in the context of China, Steele wrote, “Although there are many steps in this process – and many potential places

for mistakes – it has the advantage that eclipse prediction is reduced merely to bookkeeping, and yet the method still predicts most visible eclipses over the course of a hundred years or so. Furthermore, the calendar tends to predict too many, rather than too few, eclipses.” Later on this page we find, “The first mathematical treatment of eclipse calculation [in China] without reference to an eclipse cycle is found in the *Ch’ing-ch’u-li* from the third century AD.” Steele’s description of these methods reveals a computation to repeat an eclipse rather than a mathematical geometrical model of where the heavenly bodies will be in the future. The purpose of including this piece of history is to remove some of the exotic imagined ideas that some laymen possess concerning the abilities of ancient peoples.

The **full moon** is the moment in time (or the moon's position) in each cycle of the moon around the earth in which the center of the earth is closest to the straight line between the sun and moon. The full moon is also called the **opposition**. When the full moon occurs, it looks like a full circle. However, the time of the moon's appearance as a full circle lasts at least two nights and it looks quite circular for several nights, so without knowledgeable calculations, it is not possible to accurately determine the time of the full moon by observing the circularity of the moon. On the other hand, it is possible to use a different observational method to make a judgment of the day after the moment of full moon as follows. During the several days near the time of the full moon the following two statements are true. Before the moment of the full moon, the moon rises in the east before the sun sets in the west. After the moment of the full moon, the moon rises in the east after the sun sets in the west. Using these principles one can use the rule that the first evening in which the moon rises in the east after the sun sets in the west begins the day after the moment of the full moon. One drawback of using this observational method is that it requires a straight horizontal unobstructed view of both the eastern horizon and the western horizon, and both of these horizons must be at the same altitude above sea level. Hills and trees will hinder accuracy. Besides this, if two observers perform this activity from different locations that have opposing horizons, which differ in their altitude above sea level, it is possible that their conclusions will differ in a near borderline case.

[8] Variation from Astronomical New Moon to Full Moon; Variation from New Crescent to Full Moon

Someone may imagine that since the day immediately following the moment of the full moon could be known by the method described above, perhaps the day of the conjunction could be known from the day of the full moon. This conjecture is now discussed.

On the bottom of page 6 of Parker 1950, he wrote, “The necessary time for full moon varies from 13.73 to 15.80 days after conjunction.” This is a swing of 2.07 days, which is about 49 hours 41 minutes. This shows that the conjunction (i. e., astronomical new moon) does not have to be exactly opposite the full moon.

By examining a few cases near these extremes in the 20th century we may compare the day of the lunar month based upon whether one considers the first day of the lunar month to be the day on which the conjunction occurs or the day on which the new crescent is seen. Let us consider three cases in which the computation for visibility of the new crescent is made from Jerusalem, and the boundary for a new day is computed as sunset. For those who wish to check with other software, I am considering the latitude of Jerusalem to be 31.80 N and the longitude of Jerusalem to be 35.22 E, which are the coordinates I have seen for an official weather station of Jerusalem. The abbreviation **UT** stands for “universal time”, and is intended to refer to the time zone based upon Greenwich, England.

Case 1: Conjunction on July 7, 1967 at 17:01 UT and sunset 16:48 UT

The full moon occurred on July 21, 1967 at 14:39 UT. The time from conjunction to full moon is 13.90 days (a little over the minimum of 13.73).

Note that the conjunction occurred shortly after sunset, close to the beginning of a new day. For a month that is considered to begin on the day of the conjunction, the full moon occurs on the 14th day of the month in this example.

On the evening that ends July 9, 1967 the new crescent will be theoretically visible. For a month that is considered to begin on the day beginning with the new crescent, the full moon occurs on the 12th day of the month.

Case 2: Conjunction on December 12, 1966 at 3:15 UT and sunset 14:35 UT

The full moon occurred on December 27, 1966 at 17:45 UT. The time from conjunction to full moon is 15.60 days (a little under the maximum of 15.80 days). For a month that is considered to begin on the day of the conjunction, the full moon occurs on the 15th day of the month in this example.

On the evening that ends December 13, 1966 the new crescent will be theoretically visible. For a month that is considered to begin on the day beginning with the new crescent, the full moon occurs on the 13th day of the month.

Case 3: Conjunction on September 26, 1973 at 13:54 UT and sunset 15:32 UT

The full moon occurred on October 12, 1973 at 3:11 UT. Note that the conjunction occurred shortly before sunset, close to the end of a new day. The time from conjunction to full moon is 15.55 days (a little under the maximum of 15.80 days). For a month that is considered to begin on the day of the conjunction, the full moon occurs on the 17th day of the month in this example!!

On the evening that ends September 28, 1973 the new crescent will be theoretically visible. For a month that is considered to begin on the day beginning with the new crescent, the full moon occurs on the 14th day of the month.

Conclusion from these Examples

In these examples, for a conjunction month, the full moon occurs from the 14th to the 17th day of the month. The 17th is very rare.

In these examples, for a new crescent month, the full moon occurs from the 12th to the 14th day of the month. In the most extreme case for a new crescent month, the full moon can occur on the 16th day of the month, but this is very rare. Typically the full moon occurs on the 13th, 14th, and 15th for the new crescent month.

[9] Ancient Meaning of the Full Moon

What did the full moon mean to the ordinary person in ancient times? We have one example of what it meant to the Jewish philosopher Philo who

lived in Alexandria, Egypt and who wrote in the early first century. On page 17 of Philo_QE (section 9), in a context concerning Passover, Philo wrote, "For when it [the moon] has become full on the fourteenth (day), it becomes full of light in the perception of the people." On page 401 of Philo_7 (Special Laws 2:155), in a context concerning the seventh month, Philo wrote, "The feast begins at the middle of the month, on the fifteenth day, when the moon is full, a day purposely chosen because then there is no darkness, but everything is continuously lighted up as the sun shines from morning to evening and the moon from evening to morning and while the stars give place to each other no shadow is cast upon their brightness." We see here that Philo considers both the 14th and the 15th days of the month to be days of the full moon. Hence he does not consider the full moon to be an instant in time or only one day of the month, but a general period when the moon is quite circular. As an ordinary person he did not adopt the meaning for the full moon of advanced Greek astronomers as a mathematically predicted moment when a lunar eclipse would sometimes occur. Due to the elliptical orbit of the moon, this mathematical moment will vary by a few days in relation to the conjunction, and it will also vary by a few days in relation to the new crescent. The precision of mathematics was not Philo's approach to the meaning of the full moon.

Although Philo, a Jew who lived in Alexandria, Egypt, is a historical first century witness that the moon is full on the 14th and 15th days of the Jewish months, this is not a biblical argument that a biblical month is full on the 14th and 15th days of the month.

In the first century BCE Vitruvius wrote the views of the Greek astronomer and mathematician Aristarchus of Samos (c. 280 BCE) concerning the full moon. On page 264 Vitruvius (translated by Morgan) wrote, "On the fourteenth day, being diametrically across the whole extent of the firmament from the sun, she is at her full and rises when the sun is setting." This is approximately the rule given above, namely the first evening in which the moon rises in the east after the sun sets in the west begins the day after the moment of the full moon. However, Philo of Alexandria took a looser concept of the full moon allowing both the 14th and 15th days of the month to be days of the full moon.

[10] When in History did Prediction of the Astronomical New Moon Begin?

The history of ancient astronomy shows that it was not until near the time of the birth of Alexander the Great that ancient astronomers were first able to estimate the time of the conjunction of the moon by a calculation.

On page 169 of van der Waerden, he wrote:

“In Babylonia, the month began on the evening on which the crescent was visible for the first time after [the astronomical] New Moon. More precisely: If on the [ending] evening of the 29th day of any month the crescent was visible, the month has 29 days; if not, the month has 30 days. The same rule still holds in Muslim countries.”

“I shall call these months ‘observed lunar months’. The words of Geminus indicate that the Greek months originally were just observed lunar months.”

“The months beginning with the conjunction will be called ‘exact lunar months’ or ‘conjunction months’. These months are a theoretical construction; they could not be used in practice in classical times, because before Kallippos [Callippos] (330 B.C.) astronomers were not able to predict the true conjunction.”

Thus van der Waerden points to 330 BCE as the time before which ancient mathematical astronomical knowledge was not able to predict the time of the astronomical new moon.

The orbit of the moon around the earth is an ellipse. The earth is not at the center of this ellipse, but at one of the two foci of the ellipse. The moon moves faster around the earth when it is closer to the earth than when it is farther from the earth. Due to the sun's gravitational attraction to the earth and moon, the distance from the earth to the sun affects the distance from the moon to the earth, which in turn affects the time from conjunction to conjunction! The exact time from conjunction to conjunction does vary through the year! Knowing the average time from conjunction to conjunction does not help to know any current lunar month's time from conjunction to conjunction.

The minimum time from one conjunction to the next conjunction is 13 hours 40 minutes less than the maximum time from one conjunction to the next conjunction (see pages 21-22 in Stephenson and Baolin). A mathematical mastery of this variation is needed in order to accurately predict the time of an astronomical new moon.

A high level of confidence of the accurate prediction of solar eclipses by ancient peoples was certainly impossible because this requires a knowledge of where the moon's shadow will reach the earth, and that requires a knowledge of the distance from the moon to the earth (which requires a knowledge of the elliptical orbit of the moon), the size of the earth, and the shape of the earth (which is somewhat pear-shaped rather than perfectly spherical). Since they could not predict the shadow path of the moon upon the earth, the best they could achieve is a statement that a solar eclipse was a reasonable possibility. But in order to do that, they would need to have a good ability to predict the astronomical new moon as well as how to rule out most astronomical new moons as being capable of providing a solar eclipse. This simply shows that we can judge the ability of ancient astronomers to approximately predict the astronomical new moon by their attempts to predict a possible solar eclipse.

Of specific interest is the paper by John M. Steele 1997 where, on page 134 he lists the oldest Babylonian solar eclipse prediction for which we have full data in 358 BCE, exactly 100 years after Ezra first brought a group from the House of Judah back to Jerusalem after the Babylonian captivity. This solar eclipse prediction was 181 years after King Cyrus the Great of Persia conquered Babylon on October 12, 539 BCE (see page 14 of Parker and Dubberstein). Since the empire was now the Persian Empire rather than the Babylonian Empire, the learned astronomers who continued their work should be called Persians, but the general practice is to continue referring to them as Babylonian or "late Babylonian". The same pagan priests continued to improve their work in mathematical astronomy. John Steele 1997 analyzes the 61 preserved solar eclipse predictions of the Babylonians for which full data is available including the time at which the eclipse is hoped to be seen, and these fall within the years 358 BCE - 37 CE. The terminology used by the Babylonians shows that a solar eclipse was to be "watched for", showing an uncertainty that it would be seen. Less than half (28 of 61) were either seen or would have been seen if the precise time of the eclipse would have occurred during daytime in the region of Babylon. In other words, in these 28 cases the latitude of the moon's shadow did fall within some part of greater Babylon, but in the other 33 cases the moon's shadow was outside this region. These ancient astronomers used water clocks, which divided the day into 360 equal parts, each being four minutes. The average error of these water clocks is eight minutes from true time. The predictions included the calculated time for the eclipse to occur. The worst two predictions among these 28 cases were 8.08 hours in error and 4.76

hours in error (page 135). The average error was 1.96 hours (page 136). For the other 33 cases of predictions the average error in the time of conjunction (here the word “conjunction” relates to a hoped for solar eclipse) is 3.67 hours, nearly twice as great (page 137)! Their predictions of solar eclipses did not get more accurate in the later period of their recordings (pages 138-139).

The mathematical methods that were used by the Babylonians were very different from the methods used by the Greeks. The former used nearly repeating sequences based on prior historical records (not a formula based on a general physical mathematical model), while the latter developed a geometrical mathematical model based on circles after 400 BCE. The Greeks were aware of the methods used by the Babylonians (see page 118 of Jones, the chapter by Toomer 1988, and page 61 of Fatoohi and others), but the most advanced Greek astronomers preferred their own methods. The methods of the Greeks were more advanced in the sense that they were based on mathematical methods for approximate geometrical models, and the geometry itself led to the concept of the conjunction. In contrast to this, the Babylonians were interested in predicting solar eclipses, which by definition only occur at the time of a conjunction; they did not show a general interest in predicting the time of all conjunctions, and this was likely the cause for van der Waerden's limiting of the year for calculating the approximate astronomical new moon (conjunction) to 330 BCE. On page 41 of Aaboe we read, “Babylonian mathematical astronomy has two features that seem strange to modern eyes, and it may thus be in order to mention them here. First, it is entirely arithmetical in character or, in negative terms, there is no trace of geometrical models like the ones we have become accustomed to since the time of Eudoxos [Greek astronomer of Cnidos, c. 408 to 355 BCE. (see pages 63-66, 335 of Pedersen 1993)]. Second, the cuneiform literature [clay tablets bearing the Akkadian language of the Assyrians and a remnant of the Babylonians] nowhere attempts to justify the precepts of the procedure texts; thus it has rested with modern scholars to uncover the underlying theoretical structures.” In other words, the Babylonians have left us their many tablets showing columns of numbers, and it remained for modern scholars to decode the meaning of these columns and how they were computed. In some cases there are narratives that accompany these numbers that mention certain sighted phenomena in the heavens or some indications of the meanings of one or more columns, but there are no geometrical diagrams showing a mathematical model of anything in the heavens among the Babylonians.

The conclusion is that there are unusual aspects of the variation of the moon's cycle around the earth that prevented ancient people from predicting the approximate conjunction until about 330 BCE by the advanced methods of the Greeks, or instead, until about 360 BCE for the non-geometrical methods of the Babylonians whose average error was about three hours. Moreover, the Babylonians were focused on solar eclipses rather than conjunctions in general, while the Greeks showed an interest in conjunctions. Another very significant factor that contributed to the difficulty of predicting the conjunction is the lack of visual confirmation of a conjunction unless there was a rare solar eclipse to confirm it. The water clocks used by the ancient Babylonian astronomers had an average error of eight minutes and their smallest unit of measuring time was four minutes. Their predictions were long term, i. e., there is nothing to indicate that they attempted a revised prediction within days of a solar eclipse. When conditions were not right for a solar eclipse they never predicted a “conjunction” because it would have been foolish to predict a phenomenon that was not potentially verifiable with an observation.

A *lunar eclipse* is the covering of the sun's light to the moon by the earth as seen by an observer on the earth when the earth comes between the sun and the moon. In sharp contrast to the special difficulties of predicting solar eclipses, there are no comparable problems in predicting lunar eclipses. Lunar eclipses must occur during the full moon, may be seen by nearly half of the people on the earth where the weather is not nasty (the side of the earth where it is night), are visible more frequently than solar eclipses from any one location, have calculations that may be tested from monthly approximate sightings of the full moon, and do not require predicting the path of a shadow (in this case, the shadow of the earth upon the moon). Hence there is a vast difference between the difficulty in predicting solar eclipses (some conjunctions) and the ease in predicting lunar eclipses (some full moons) by ancient astronomers. Page 3 of Britton 1989 states, “For a given location, therefore, lunar eclipses are seen nearly 4 times as frequently as solar eclipses.” But even when there is no lunar eclipse, the full moon is still visible. When there is no solar eclipse, the moon is not visible.

Ancient Babylonian astronomers were significantly more successful in their accuracy at predicting lunar eclipses than they were at predicting solar eclipses. Of specific interest is the paper by John M. Steele and F. Richard Stephenson. The oldest Babylonian lunar eclipse prediction for which we

have full data is in 731 BCE (see page 125), which is 373 years before the first known reasonably accurate solar eclipse “hoped for” prediction by the Babylonians for which we have complete data! They were successful in their prediction for 731 BCE. Page 125 lists 35 Babylonian predictions of lunar eclipses for which we have complete data including the time of prediction to be observed. Also listed is the duration of time for which the eclipse was observed by the Babylonians, when it was successfully seen. These are dated from 731 to 77 BCE. Their average error for predicting the time of lunar eclipses was about one hour (page 130). In 90 percent of the predictions they were either successful or there was a near miss as defined by the authors (pages 123, 130). Their average error for lunar eclipse predictions was about one hour compared to about three hours for solar eclipses. It took about 400 years more for the Babylonian astronomers to be able to predict reasonably accurate possible solar eclipses (associated with the conjunction) than for them to be able to predict lunar eclipses (associated with the full moon).

There are numerous other dates of predictions of both lunar and possible solar eclipses by the Babylonians, but the time of day of their expected or hoped for sighting is not provided in the ancient sources. Without having the time of day of a predicted lunar eclipse or a possible solar eclipse it is impossible to judge the accuracy of the method of prediction, so it is not reliable to include such records in a discussion of known results. On the other hand, where columns of data are provided in a Babylonian text, it is possible for a modern specialist in this area of ancient science to judge whether the method is quite different from the more accurate later methods. In Britton 1989, John Britton evaluates the method used by the Babylonians for their earliest known attempt to predict possible solar eclipses. This text, which he called Text S, describes 38 solar eclipse possibilities from 475 to 457 BCE (see page 1 of Britton 1989). On page 44 Britton states, “We find in Text S an unusual mixture of disparate elements not known from other texts.” After discussing the method used by these Babylonians, he wrote on page 46, “Indeed, with one exception the entire theory [for predicting possible solar eclipses] can be derived from counts of phenomena (lunar eclipses, eclipse possibilities, and months), and there is no evidence that measurements of times, angles or magnitudes played any role in its creation.” From the data in Text S, Britton discusses its primary computation, which he calls “psi-star-of-S”. His conclusion on page 46 is, “We see this best in the fact that psi-star-of-S, a function clearly derived from lunar eclipses and measuring the proximity to the node of the earth's shadow at conjunction (or the moon at mid-eclipse), is correctly applied to

solar eclipse possibilities by simply moving the entire function forward half a month.” A simplified way of saying this is that these Babylonians estimated the time of the conjunction to be the midpoint between two successive computed full moons, and then judged the confidence for a solar eclipse based on the history of repeating eclipses. But we have seen above that it is very crude to estimate the conjunction to be the midpoint between two successive computed full moons, so this method for predicting solar eclipses by the Babylonians is indeed very crude compared to their later method which has an average error of about three hours. Hence we must dismiss this first Babylonian attempt at predicting solar eclipses (special conjunctions) as inferior and not to be included in the chronology with their later methods.

The conclusions are that the Babylonians were able to predict lunar eclipses by about 750 BCE with a time error of about one hour, and the Babylonians were able to predict possible solar eclipses about 360 BCE with a time error of about three hours. The Babylonians started the practice of predicting the sighting of the new crescent about 450 BCE.

[11] Transmission of Babylonian Astrology-Astronomy to other Peoples

For some decades of the 20th century Erica Reiner was the primary editor of the multi-volume Akkadian dictionary project during its development at the University of Chicago. One of her students in the study of Akkadian is Francesca Rochberg, who is one of the world’s leading scholars of this ancient language. On page 11 of Rochberg’s book in 2004 about the ancient Akkadian authors and their writings that span the period from ancient Assyria to the first century, she wrote, “In the ancient Near East, our sources do indeed indicate an indisputable progressiveness in astronomy. Nonetheless, the realms of ‘astronomy’ and ‘astrology’ were not separate in Mesopotamian intellectual culture, and so a self-conscious distinction between them such as we make in using these terms does not emerge in the cuneiform corpus.” On page 10 we find, “In the horoscopes in particular, an interdependent relationship between astrology and predictive astronomy is demonstrable by the identification of connections among a variety of astronomical text genres and the content of horoscopes. Celestial divination, which carries through from the middle of the second practically to the end of the first millennium B.C., and the Babylonian astronomy of the post-500 B.C. period provide the intellectual context for the Babylonian horoscopes, which bear relation to both of these distinct traditions. Because of these

relationships, the horoscopes afford a unique view into Late Babylonian astronomical science.” On page 41 we find, “... from a social point of view, Late Babylonian astronomy was supported by the institution of the temple.” Also on page 41 we find, “It is clear that the individuals who computed astronomical phenomena were the same as those who copied omen texts and constructed horoscopes.” On page 165 we find, “The following discussion is limited to those ideas that can be extracted from and supported by the literature of the Babylonian scholar-scribe who specialized in divination and took part in its related activities, such as prayer, incantation, or, indeed, the mathematical prediction of lunar eclipses.”

David Brown wrote on page 7 of his book, “The term ‘astrology-astronomy’ will be used to refer to the particular branch of Mesopotamian scholarship herein considered. It is to be differentiated from cosmological or cosmogonical speculation – theories concerning the universe as a whole, or concerning the creation of the universe as a whole. Astrology and astronomy mean different things today, but the two words were used interchangeably at least until the 6th century AD. That is not to imply that before this time no difference was ever appreciated between what we would term astrology and what we would term astronomy.”

At the time of the captivity and exile of the House of Judah to Babylon from 604 to 586 BCE, the common language of Babylon was Aramaic, but the written language of the Babylonian priests, who produced mathematical astronomy with its base 60 positional numbering system, continued to be the Akkadian language of the previous Assyrian Empire, through there were various dialects. David Brown wrote on page 31, “When reconstructing the background to the emergence of the accurate predicting of celestial astronomy, it is important to recall that the cuneiform languages, dialects and scripts were used only by an elite. The scientific developments that form the locus of this study appear only in these scholarly languages [not Aramaic].”

Because of their positional numbering system and their motivation to use predictive astronomy for astrological purposes that gave them prestige and income, these Babylonian priests developed generalized methods for multiplication and long division of fractional numbers. Thus the scientific language of the Babylonian priests who were the mathematical astronomers was hidden from the general population that had ceased using the Akkadian

language. Except for the private use by these priests, the Akkadian language ceased being a living language.

The prophet Daniel was given great authority in the secular government during the period c. 600 to c. 540 BCE, and based upon the biblical account in Daniel 2, he and his three friends were highest in the government. The Babylonian pagan temple priests were simultaneously reduced in authority. On page 209 Francesca Rochberg wrote, "One determinable change in the environment of later Babylonian scholarship was the shift of the locus of astronomical activity from the palace [i. e., support by secular government] to the temple [pagan support]. When exactly this occurred, however, is not well documented." On this same page we find, "By the fourth century B.C., however, evidence for the intense involvement of the king with the [pagan priestly] scholars appears to diminish." Rochberg neglected to see the excellent documentation in the Bible! When Daniel gained authority under King Nebuchadnezzar, he reduced the influence of the pagan priests who practiced their mixture of astrology with astronomy. Eventually they were ousted from the palace and took refuge in the pagan temple where they continued their practices. Both Ezra and Nehemiah, c. 450, were given favor by King Artaxerxes, and undoubtedly the pagan priests remained in disfavor with the king. On page 235 Rochberg wrote, "Regardless of the way astronomy functioned within the temple institution, association with the temple was without doubt the key to the survival of Babylonian astronomy for so many centuries after it had become seemingly defunct in the political sphere."

There is no historical evidence to indicate any cooperative sharing between the Levitical priesthood and the pagan Babylonian astrologers-astronomers who continued writing their documents in the Akkadian language, which the general population did not understand. The Akkadian cuneiform script was vastly different from the 22-letter alphabet of both Hebrew and Aramaic. Akkadian script consisted of hundreds of wedge-shaped signs (see page 1 of Dalley). Since Scripture is opposed to the use of horoscopes (see Isa 47:13 for the general tone, although it does not directly refer to horoscopes), and these were intimately associated with activities of the pagan temples where astronomy was pursued and preserved, zealous Levitical priests should have been motivated to stay away from such places and activities.

Pages 237-244 of Rochberg 2004 discuss the transmission of Babylonian astrology with astronomy to the Greeks after Alexander the Great conquered

the Persian Empire in 331 BCE, and afterward to India. Astrology and astronomy were sent together as a package.

[12] Egyptian Astronomical Science before Alexander the Great

Today a child learns to distinguish between 25, 205, and 2005 through the base ten position of the zeros. When performing the operations of addition, subtraction, multiplication, and division without a calculator, the vertical alignment of the digits into neat columns of units' digits, tens' digits, hundreds' digits, etc., makes the general procedure for these basic operations seem exceptionally simple. In today's society we take this simplicity for granted. But archaeological remains of calculations by different ancient civilizations reveals that very few ancient cultures had a concept of a base value (such as 10) in which the same symbol (such as 2) in a different position would have a different value (such as 2, 20, 200, et cetera). The written biblical examples of numbers in the Hebrew language show no knowledge of a base ten positional number system with a symbol for zero to define the position and hence the value. Without this positional base concept using a zero, general long division becomes very cumbersome and time-consuming. For example, if the reader attempts to use the symbolism of the Roman number system (with "L" for 50, "XL" for 40, "C" for 100, "M" for 500, etc.), and then attempts to do general long division in this system, it will be a significant chore. Although ancient societies had a concept of a fraction and they knew how to divide by 10 (obtaining a tithe) because the language used words that were multiples of 10, this certainly does not imply that they had a simple general method for long division that could be done quickly. Dividing by 5 was twice a tithe, so that was easy. Dividing by 20 was half a tithe, so that was easy. But these are special examples rather than a general method for long division that would work for all numbers. Try dividing the Roman equivalent of 237892.21 by the Roman equivalent of 542.37 using only the Roman number system and see how far you get without our modern symbolism for numbers with a zero. Without a positional base number system using a zero, the method for general long division that elementary school children are taught today would not even exist because that very method depends on position.

The reference RMP (= Rhind mathematical papyrus) is an explanatory book concerning ancient Egyptian mathematics published by the British Museum. It provides a detailed analysis of a papyrus from ancient Egypt that gives examples of how to solve a wide variety of mathematical problems. Page 16

of van der Waerden 1961 dates this papyrus after 1800 BCE, which is after the time of the building of the great pyramids at Giza. Page 12 of RMP states, “The hieroglyphic script had distinct signs for units, tens, hundreds, etc., the numbers of each being indicated by repetition of the sign. There was no sign for zero and no positional notation, so that the representation of large numbers became extremely cumbersome.” Page 5 of Gillings states that the ancient Egyptian method for writing the number 1967 required 23 characters while the method for writing 20,000 required only two characters. This ancient Egyptian method for the representation of numbers does not enable the simple methods of general long division used by modern elementary school children or the equivalent simple methods used by the ancient Babylonians. Pages 16-18 of RMP give examples of how long division was performed by the Egyptians, and page 19 of van der Waerden explains the Egyptian methods for long division in a slightly different way. The methods are laborious and cumbersome by today's standards, and if there were a need for many general long division computations, it would be discouraging to have to use the methods of the ancient Egyptians. Mathematical astronomy would require extensive use of general methods of long division where the divisor may be a whole number plus a fraction.

Page 36 of van der Waerden raises the question of whether the ancient Egyptians had more advanced mathematical methods than those that have survived until today. By the word “ancient”, he means before the time of Alexander the Great, after which the city of Alexandria was founded and the Greek astronomers emigrated to Alexandria where they used the mathematical methods of the Babylonians, but dressed in the Greek language rather than the Akkadian language of the Babylonian pagan priests. He gives two reasons against this. One reason is that there are both elementary mathematical Egyptian texts and advanced texts, and the general character of the mathematics remains the same in both kinds of texts. The second reason is that the Greeks had access to ancient Egyptian mathematical and geometrical methods. The Egyptians successfully used the geometrical methods in a practical way for building purposes, and the Greeks did use selected geometrical methods of the ancient Egyptians. If the Egyptians had developed good methods for doing arithmetic, we would also find some trace of this among the many Greek writings in mathematics. But the Greeks only show use of the Babylonian methods in arithmetic. The ancient Egyptians did *not* use the positional base 60 number system of the Babylonians or the Babylonian multiplication tables up to 60 times 60.

Pages 353-356 of Ruggles discusses the pyramids of Giza, which are the most impressive pyramids of Egypt. Ruggles makes it clear that we do not know the methods by which the Egyptians constructed these massive monuments. In modern times several writers have made guesses concerning how this may have been done. The largest pyramid required over two million blocks, each weighing about 15 tons, and it is not known how the blocks were transported to such a height. They must have had an excellent knowledge of applied levers and pulleys, but even this supposition does not explain how they could have done it. Our lack of knowing how this marvelous feat of construction occurred is not evidence that it required advanced methods of mathematics that differs significantly from the examples we already possess. The mathematics needed for building construction is different from the mathematics that is needed for mathematical astronomy.

On pages 128-129 of Clagett, he wrote the following:

“It should be clear from my summary account that the ancient Egyptian documents do not employ any kinematic models, whether treated geometrically or arithmetically. However they did use tabulated lists of star risings and transits (as is revealed clearly in Documents III.11, III.12, and III.14), all tied to their efforts to measure time by means of the apparent motions of celestial bodies.”

“On more than one occasion in this chapter, I have remarked on the absence in early Egyptian astronomy of the use of degrees, minutes, and seconds to quantify angles or arcs, though slopes were copiously used in the construction of buildings, water clocks and shadow clocks, such slopes were measured by linear ratios.”

Otto Neugebauer (1899-1990) is unquestionably considered to be the greatest historian of ancient mathematical astronomy in the 20th century. He studied the ancient Egyptian language as well as the ancient Assyrian language known as Akkadian (see pp. 289-290 of Swerdlow 1993), and his pioneering studies were based on his own readings of the original texts. Neugebauer first studied how to read Egyptian hieroglyphics so that he could study ancient Egyptian mathematics from the original documents. Before he began his studies on ancient Egyptian and Babylonian astronomy, he made a detailed study of their mathematics. His doctoral dissertation was

on ancient Egyptian mathematics, primarily based on the Rhind Papyrus from ancient Egypt.

After repeated efforts Neugebauer convinced Richard Anthony Parker, the most acclaimed expert on ancient Egyptian science and calendation, to leave the University of Chicago and join him as a professor at Brown University in 1949. Neugebauer and Parker published three volumes of ancient Egyptian astronomical texts from before the time of Alexander the Great (see Neugebauer and Parker). These many texts from ancient Egypt show that we have an understanding of their ancient knowledge of astronomy. These texts show no indication of the abilities later achieved by the Babylonians and Greeks in predictive astronomy, as Clagett pointed out.

On page 559 of HAMA, Neugebauer wrote, “Egypt has no place in a work on the history of mathematical astronomy. Nevertheless I devote a separate ‘Book’ on this subject [10 pages] in order to draw the reader's attention to its insignificance which cannot be too strongly emphasized in comparison with the Babylonian and the Greek contribution to the development of scientific astronomy.”

Concerning the extremely high accuracy of aligning the largest ancient Egyptian pyramids with the east-west direction, and hence a precise knowledge of the time of the equinoxes by the ancient Egyptians, Neugebauer 1980 wrote on pages 1-2, “It is therefore perhaps permissible to suggest as a possible method a procedure which combines greatest simplicity with high accuracy, without astronomical theory whatsoever beyond the primitive experience of symmetry of shadows in the course of one day.” A diagram and further discussion by Neugebauer explain how the Egyptians could have achieved the accurate alignments without any mathematically sophisticated theory. The reason he sought and proposed this method is simply that his studies into ancient Egyptian mathematics and astronomy did not hint at any Egyptian ability to accurately predict the time of the equinoxes.

Ronald Wells wrote a chapter titled “Astronomy in Egypt”, which concerns the time before Alexander the Great and his command to build the most modern city of ancient civilization, Alexandria. On page 40 of this chapter, Wells provides the following summary: “Historians of science concede only two items of [astronomical] scientific significance bequeathed to us by the ancient Egyptians: the civil calendar of 365 days used by astronomers even

as late as Copernicus in the Middle Ages, and the division of the day and night into 12 hours each. These fundamental contributions may seem meager to many; engineering of the pyramids and surviving temples notwithstanding.” Page 7 of this book edited by Walker states, “Ronald A. Wells was a Fulbright scholar in Egypt at the University of Cairo and at Helwan Observatory in 1983-4, and again at the Institute of Archaeology, Egyptology Division, University of Hamburg, in 1987-8.”

Otto Neugebauer wrote (1945) on page 11, “It will be clear from this discussion that the level reached by Babylonian mathematics was decisive for the development of such methods [for the numerical study of astronomy]. The determination of characteristic constants (e.g., period, amplitude, and phase in periodic motions) not only requires highly developed methods of computation but inevitably leads to the problem of solving systems of equations corresponding to the outside conditions imposed upon the problem by the observational data. In other words, without a good stock of mathematical tools, devices of the type which we find everywhere in the Babylonian lunar and planetary theory could not be designed. Egyptian mathematics would have rendered hopeless any attempt to solve problems of the type needed constantly in Babylonian astronomy.” On page 8 he wrote, “It is a serious mistake to try to invest Egyptian mathematical or astronomical documents with the false glory of scientific achievements or to assume a still unknown science, secret or lost, not found in the extant texts.”

Neugebauer wrote (1969) on page 78, “The handling of fractions always remained a special art in Egyptian arithmetic. Though experience teaches one very soon to operate quite rapidly within this framework, one will readily agree that the methods exclude any extensive astronomical computations comparable to the enormous numerical work which one finds incorporated in Greek and late Babylonian astronomy. No wonder that Egyptian astronomy played no role whatsoever in the development of this field.”

From the many ancient texts of the Egyptians we conclude that they did not apply mathematics to astronomy before the time of Alexander the Great. After that time, the city of Alexandria was founded and the leading Greek mathematicians and astronomers settled in that city of Egypt, so that it became the world's leading center of Greek astronomy. But this was not part of ancient Egyptian culture; instead, it was the transplanting of Greek

science into Egypt by foreigners due to the newly constructed city of Alexandria with its modern marble streets and its grand marble museum and library. This combination museum and library with its many lecture halls became the best ancient equivalent to a modern university, and its library became the greatest one in ancient times.

The attention devoted to ancient Egypt serves the purpose of showing that ancient Israel could not have obtained knowledge of mathematical astronomy from Egypt because Egypt did not possess knowledge of mathematical astronomy.

[13] Did Abraham teach Mathematical Astronomy to the Egyptians?

The Jewish historian Josephus (37 – c. 100) wrote a history of the Jews that has many details that are not found in Scripture, and the question arises concerning whether these details are all true. One of these details concerns the abilities of Abraham and the Babylonian knowledge of mathematical astronomy at the time of Abraham.

On page 83 of Josephus_4 we find at Antiquities 1:166-168, “For, seeing that the Egyptians were addicted to a variety of different customs and disparaged one another’s practices and were consequently at enmity with one another, Abraham conferred with each party and, exposing the arguments which they adduced in favour of their particular views, demonstrated that they were idle and contained nothing true. Thus gaining their admiration at these meetings as a man of extreme sagacity, gifted not only with high intelligence but with power to convince his hearers on any subject which he undertook to teach, he introduced them to arithmetic and transmitted to them the laws of astronomy. For before the coming of Abraham the Egyptians were ignorant of these sciences, which thus traveled from the Chaldaeans into Egypt, whence they passed to the Greeks.”

The previous conclusions that were attained from archaeology with the help of computers and the modern knowledge of mathematical astronomy are now restated. The Babylonians were able to predict lunar eclipses by about 750 BCE with a time error of about one hour, and the Babylonians were able to predict possible solar eclipses about 360 BCE with a time error of about three hours. The Babylonians started the practice of predicting the sighting of the new crescent about 450 BCE. But Abraham lived c. 2000 BCE, over 1000 years before the great achievements of Babylonian mathematical

astronomy occurred. Furthermore, ancient Egypt did not possess mathematical astronomy until the Greeks emigrated there and brought it with them after the death of Alexander the Great in 323 BCE. We therefore conclude that Josephus did not know the history of the acquisition of mathematical astronomy by the Egyptians, and it does not make sense to believe that Abraham knew any significant mathematical astronomy himself. Furthermore, the Egyptians did not use the Babylonian positional base 60 number system, which they would have used it if Abraham had convinced them of its superiority.

About a century before Josephus, other Jews bragged about Abraham's achievements, even in astrology! The interested reader may consult pages 146-151 of Gruen.

[14] Did Ancient Israel Excel in Advanced Mathematical Astronomy?

Scripture defines the wisdom of ancient Israel in an unconventional way in the following passage.

Deut 4:5, "Behold I have taught you statutes and ordinances as YHWH my Almighty commanded me, that you should do so in the midst of the land where you are going to possess it."

Deut 4:6, "So keep and do [them], for that [is] your wisdom and your understanding in the sight of the peoples who shall hear all these statutes. Then they shall say, surely this great people [is] a wise and understanding nation."

Deut 4:7, "For what great nation [is there] that has an Almighty [so] near to it as YHWH our Almighty in everything we call upon Him."

Deut 4:8, "And what great nation [is there] that has statutes and ordinances [as] righteous as all this law that I set before you today?"

The nations of the world think of wisdom in terms of scientific achievement and the acquiring of great knowledge, but that is not the way Moses was told to proclaim wisdom to Israel. Mathematical astronomy was not to be wisdom for them. I do not doubt that the ancient Israelites had the mental capacity to be able to develop advanced mathematics, but without the collective need for this effort by Israelite society, what would motivate such an effort? Ancient Israel could determine the calendar from observation, so they had no need for any advanced tedious calculations.

Did ancient Israel use a positional digit system with a zero, which would enable rapid multiplication and division? On page 26 of GKC2 (the latest English edition of the Hebrew grammar book by Gesenius), the numerical value of the 22 Hebrew letters is presented. This shows one letter for the value 2, another letter for the value 20, and another letter for the value 200. This illustrates the nature of the symbolic number system in ancient Hebrew, and shows that it was not a positional digit system with a zero. Page 30 has further comments on this system, which was used on coins in Judea from the Maccabean period (c. 150 BCE). The time of the origin of this system is unknown. This system would be a hindrance for general long division and is not useful for mathematical astronomy.

A good deal of effort has been put into the history of ancient astronomy in previous chapters in order to evaluate what could have been known by ancient Israel at the time of Moses and afterward. The ancient Israelites from the time of Moses in Egypt could not have borrowed mathematical astronomy from Egypt because Egypt did not possess mathematical astronomical knowledge until it was brought there by Greek astronomers more than 1000 years after Moses died. From biblical chronology I estimate that the Israelite exodus from Egypt occurred c.1480 BCE.

Although the Jews were in captivity in Babylon where the pagan priests had an advanced knowledge of both mathematics and mathematical astronomy written in the complex Akkadian language with its hundreds of symbols for words (not for numbers), there is no evidence that these Jews acquired this knowledge. Ancient Jewish writings from the Dead Sea Scrolls, from Philo, from Josephus, from archeological artifacts, and from the *Mishnah* (c. 200 CE), give no hint that the Jews became familiar with the Babylonian mathematical methods of computation before the time of the Greek astronomer Ptolemy (c. 150) CE who lived in Alexandria, Egypt. The Talmud does claim that Mar Samuel was able to compute a calendar for many years in advance, c. 250 CE, although none of the details are known.

Jewish scholars do not claim that the ancient Israelites had abilities in mathematical astronomy that surpassed that of their ancient neighbors. There is no historical evidence for it. On pages 555-556 of Langermann we find, "Although the sun, moon, and stars are mentioned in the Hebrew Bible, that ancient and sacred text does not display any sustained exposition which can be called an astronomical text. The earliest sources for a Hebrew tradition are found in a few passages in the Talmud and Midrash [c. 200-600 CE]."

The *Babylonian Talmud*, specifically the section designated Rosh Hashanah 25a (RH 25a), which is on page 110 of BT-BEZ-RH, quotes Rabban Gamaliel II of Yavneh as having said, “I have it on the authority of the house of my father's father [Gamaliel the Elder from the early first century] that the renewal of the moon takes place after not less than twenty-nine days and a half [day] and two-thirds of an hour and seventy-three halakin.” Since there are 1080 halakin in one hour, this is 29.5 days 44 minutes $3 \frac{1}{3}$ seconds. Thus RH 25a claims that from one new moon to the next new moon is at least this length of time. On page 308 of Swerdlow this is shown to exactly equal the value used by the Greek astronomer Hipparchus (c. 190 - c. 120 BCE) for the average length of the month, which he wrote in the base 60 as 29;31,50,8,20 days, which equals $29 + 31/60 + 50/(60 \times 60) + 8/(60 \times 60 \times 60) + 20/(60 \times 60 \times 60 \times 60)$ days. But did Hipparchus derive this value himself? No! The paper by Toomer 1980 discusses this value for the average lunar synodic month in more detail. On page 108 footnotes 6 and 11 he clearly points out (as he implied on pages 98-99) that the Babylonians had already derived this value at an earlier time, and thus he shows that this value was not first computed by Hipparchus, but accepted as true by Hipparchus and taken by him from the Babylonians. Toomer also gives credit to Asger Aaboe for a paper he wrote in 1955 indicating that Aaboe realized that this number came from the Babylonians rather than Hipparchus. On page 98 Toomer credits F. X. Kugler as apparently recognizing this in a book he wrote dated 1900. On pages 168, 240-241 of Hunger and Pingree it is stated that this length of an average synodic month comes exactly and directly from column G in the Babylonian lunar System B, and on page 236 this book states that the earliest tablet containing System B material from Babylon is dated 258 BCE. Hence this number was derived by the Babylonians some time before 258 BCE. On page 54 of Britton 2002, John Britton estimates the origin of the mean synodic month to c. 300 BCE.

How might ancient people determine the length of a lunar month? By taking two widely separated eclipses of the same kind and when the moon is traveling at about the same point in its cycle of varying velocity, and then dividing the time length between them by the number of lunar months, one may estimate the average length of a synodic month. Hipparchus was trying to compute eclipse periods, and for this purpose he used two old records of eclipse observations from Babylon that he possessed as well as two eclipse observations from his own lifetime. From these two pairs of eclipses

Toomer's paper explains that a computation of the average lunar synodic month would in fact disagree with the number that he received from Babylon, but Hipparchus accepted their number anyway. The last of the base 60 numbers above is 20, but the computation from Hipparchus' eclipse records would instead round off this last number to a 9. While the long division computation gives a different number, the difference between these values is less than a tenth of a second! How accurate are these numbers (20 and 9 for the last place) compared to the true value of the average lunar synodic month near the time of Hipparchus and the earlier Babylonians?

On page 87 of Depuydt 2002, Leo Depuydt provides the following estimated modern computations for the mean synodic month in the years 2000 BCE, 1000 BCE, and 1 CE, and I have converted these to the Babylonian base 60 system. The computed estimated time is based upon eclipse records going back to 747 BCE and the assumption that the trend continued in a similar way prior to that date.

2000 BCE 29d 12h 44m 2.08s = 29; 31, 50, 5, 12
1000 BCE 29d 12h 44m 2.29s = 29; 31, 50, 5, 43.5
1 CE 29d 12h 44m 2.49s = 29; 31, 50, 6, 13.5

Compare the above modern computed lengths of the mean synodic month through time with that of the Babylonians and the Greek astronomer Hipparchus below.

Babylonians c. 300 BCE = 29; 31, 50, 8, 20 (also the Talmud)
Hipparchus' data c. 150 BCE = 29; 31, 50, 8, 9

We have seen that the *Babylonian Talmud*, which was released by Jewish scholars c. 600 CE, uses the exact time length of a mean synodic month that originates from ancient Babylonian astronomers at roughly 300 BCE, yet the Talmud refers back to the house of Gamaliel in the first century for this figure. Is it reasonable to think that some Israelites derived this time for the average length of a lunar month independently on their own? No it is not, because this number is slightly under one second too large based upon the above data. The use of different eclipse records for a computation ought to give a different result. The paper by Toomer points out that the Greek astronomer Ptolemy of Alexandria c. 150 CE wrote about the achievements of Hipparchus 300 years earlier, and both of them realized that picking a different pair of eclipses from which to compute the average length of a

lunar month would provide a different result. Ptolemy discussed the specific nature of which eclipse records would likely produce a more reliable result, and he based this on the earlier work of Hipparchus. The reason for the use of different eclipses producing a different result is that the apparent speed of the moon as observed from the earth varies at different times of the month, at different times of the year, and at different times of the eclipse cycle known as the Saros, which is 223 mean synodic months (18.03 years). Thus any computation based upon a specific pair of eclipse observations will result in a unique value for the average length of a lunar month, although properly chosen records will provide close results.

The Babylonians began predicting the visibility of the new crescent at roughly the year 400 BCE, and this prediction is based upon an accurate understanding of the moon's cycle for repeating its speed variation, or lunar anomaly, within the Babylonian System A (see the paper by Britton 1999, especially page 244). The cycle of lunar anomaly is the Saros cycle. From roughly this time onward they would be in a good position to be able to judge which pair of eclipse records should produce an accurate figure for the average lunar synodic month. As stated above, the oldest existing Babylonian System B material is dated 258 BCE, and this system includes the fundamental parameter that Hipparchus used for the mean synodic month, which was championed by Ptolemy c. 150, and was later incorporated into the *Babylonian Talmud* c. 600. We have no explicit knowledge of exactly when or exactly how this length of the mean synodic month was determined within System B by the Babylonians, although it is a very reasonable conjecture that some pair of eclipse records from the same part of a Saros cycle was a key. On page 45 of Britton 2002, John Britton estimates the origin of System B to be as early as c. 330 BCE, but on page 54 his estimate for the origin of the mean synodic month is c. 300.

1. Pages 13 and 22 of Spier show that the modern calculated Jewish calendar uses the approximation for the average length of a month from RH 25a in the *Babylonian Talmud*, yet we now know that this came from ancient Babylonian astronomers c. 300 BCE. The *Babylonian Talmud* is called “Babylonian” because its Jewish authors lived in Babylonia at the time of its publication c. 600 CE, not about 900 years earlier when the Babylonian astronomers derived this figure. But other factors are also used for the modern calculated Jewish calendar, which are not due to either ancient Babylon or Hipparchus, and are not found in the Talmud. Num 10:10 shows a

responsibility of the Levitical priesthood in declaring the “beginning of the months”, and thus control of the calendar and its knowledge could be expected to have been passed down from generation to generation via the hereditary priesthood. However, after the Temple was destroyed in 70 CE the Levitical priesthood vanished from Jewish history along with its influence over the calendar. No writings from this priesthood have survived from before the destruction of the Temple, except for the fact that Josephus was a priest who was born in 37 CE and died c. 100. While his writings exist, none of them were written before the destruction of the Temple, and he does not discuss when a month begins in any direct way. He never mentions any astronomical calculations being done by the ancient Jews, and neither does Philo of Alexandria (c. 20 BCE - c. 50 CE).

In order to perform the mathematical computations for general long division of fractional numbers that would be necessary for predictive astronomy, it would be necessary to utilize a number system with a base, which would therefore enable a positional notation and the use of a symbol for zero. For computational uses without a computer, modern society uses the base 10 for ordinary purposes, although modern computers use the base 2, and for the sake of human ease of readability, the base 2 is typically converted to base 16 (hexadecimal) for computer professionals. The Babylonians and Greeks used the base 60 number system for their capable calculations. After the achievements of the Babylonians and Greeks in the Eastern Hemisphere, the Mayan Indians in the Western Hemisphere used the base 20 number system. The way that the Hebrew text of the Bible expresses numerical values indicates that the ancient Israelites did not use a positional number system with a base and a symbol for zero.

Hence, from a mathematical viewpoint along with the lack of any archaeological evidence to the contrary (although there are archaeological discoveries in the site of ancient Israel), it is safe to conclude that ancient Israel, before the destruction of Solomon’s Temple by Nebuchadnezzar in 586 BCE and the three waves of Israelite exile to Babylon from 604–586 BCE, did not possess the type of mathematical abilities that would have enabled them to perform the mathematical computations needed for success at predictive astronomy.

The ancient pagan Babylonian priests were interested in astrology. They predicted the future of kings and kingdoms. They gained wealth and political

prestige through this practice until Daniel told both the dream and its interpretation to the king (Daniel 2). They then lost political prestige, but their pagan practices continued as they developed horoscopy. Some of these pagan priests were the predictive astronomers. Their desire for wealth and prestige led to their efforts at computational and predictive astronomy. The Greeks had a greater interest in science for the sake of knowledge, although they too were interested in astrology and its use to gain wealth. The leisure time to devote to astronomy came from the wealth gained by astrology.

The historical evidence indicates that neither the ancient Israelites before the destruction of Solomon's Temple in 586 BCE nor the Jews after this until the destruction of the Second Temple in 70 CE sought to develop their own mathematical astronomy. Ancient Egypt before Alexander the Great did not possess any predictive mathematical astronomical knowledge, so ancient Israel could not have inherited such knowledge from them. Neither the Bible, nor archaeology, nor Jewish history give any indication that Israelites before the destruction of the Second Temple in 70 CE had advanced abilities in mathematical astronomical knowledge. It was not until the time of Alexander the Great, that ancient astronomers were able to approximately predict the time of the true conjunction.

The difference in time between the computed average time of the conjunction (based on repeated additions of the average synodic lunar month, which is employed in the modern calculated Jewish calendar) and the true conjunction is about 14 hours according to page 45 of Wiesenbergs. Thus the modern calculated Jewish calendar (MCJC) is not based upon predicting the true conjunction. The Jews at the time of Moses were not using the MCJC with its adoption of the Babylonian length of the average month, and they were not able to calculate the time of the conjunction.

[15] Authority of the Levitical Priesthood from the Tanak

A. The Levitical Priesthood has a Role regarding the Calendar

According to the law of Moses certain activities related to the calendar are required to be performed by the Levitical priesthood. Specifically, at the beginning of each month, in the context of Num 10:1-10, notice the following activity of the priesthood.

Num 10:8, “And Aaron's sons, the priests, shall blow with [the two silver] trumpets.”

Num 10:10, “And on [the] day of your gladness, and on your appointed-times [4150 *moed*], and on the beginnings of your months [2320 *chodesh*], you shall blow with [the two silver] trumpets over your burnt offerings and over [the] sacrifices of your peace offerings, and they shall be to you for a memorial before your Almighty; I am YHWH your Almighty.”

A partial summary of this requirement from the law of Moses is that two priests (from Aaron and his seed) were to blow two trumpets on the first day of each month, thus giving the priests a role of significance in regard to the start of the calendric unit of time called a month [2320 *chodesh*]. In a later chapter these Scriptures will be discussed in depth beginning with Num 10:1. At this time the question being addressed is whether this calendric activity of the priesthood stems from the authority given to the priesthood itself or from some other human authority such as a king or a Sanhedrin.

B. Anointing Oil is Symbolic of Authority upon Aaronic Priests

Consider the key wording by which Aaron and his sons become a priest.

Ex 29:7, “And you [Moses] shall take the anointing oil and pour [it] upon his [Aaron's] head and you shall anoint him.”

Ex 29:8, “And you shall bring his sons and clothe them [with] coats.”

Ex 29:9, “And you shall gird them [with] sashes, Aaron and his sons, and you shall bind turbans on them. And [the] priesthood shall be for them for an everlasting statute, and [in this manner] you shall fill [the] hand of Aaron and [the] hand of his sons.”

The *hand* is a symbol of power and authority. When verse nine literally states “fill the hand”, it means “to bestow authority upon”. Some translations simply have “consecrate”, which loses some of the punch.

Ex 40:15, “And you shall anoint them [Aaron's sons] as you anointed their father that they may be priests to Me. And this shall be so that their anointing shall be to them for an everlasting priesthood for their generations.”

Simply summarized, the males in lineage through Aaron shall have authority bestowed upon them as priests through a ceremony using the anointing oil upon their head. The direct Scriptures are Ex 28:41; 29:7-9; 30:30; 40:13-15.

C. The Origin and Exclusiveness of the Aaronic Priesthood

Num 3:11, “And YHWH spoke to Moses saying,”

Num 3:12, “And I, behold, I have taken the Levites from among the children of Israel instead of all the firstborn that opens the womb from the children of Israel. And [hence] the Levites shall be Mine”

Num 3:13, “because all [the] firstborn [are] Mine. On [the] day I killed all [the] firstborn in [the] land of Egypt I set apart to Myself all [the] firstborn in Israel, both man and beast. They shall be Mine, I am YHWH,”

Num 3:5, “And YHWH spoke to Moses saying,”

Num 3:6, “bring [the] tribe of Levi near and present him before Aaron the priest that they may serve him.

Num 3:7, “And they shall attend to his needs and the needs of the whole congregation before [the] tent of meeting to perform [the] service of the tabernacle.”

Num 3:8, “And they shall attend to all [the] instruments of [the] tent of meeting and the needs of [the] children of Israel to perform [the] service of the tabernacle.”

Num 3:9, “And you shall give the Levites to Aaron and to his sons. They [are] fully given to him from [the] children of Israel.”

Num 3:10, “And you shall appoint Aaron and his sons that they shall keep their priesthood. And the layman/outsider [2114 *zar*] who comes near shall be put to death.”

Num 18:6, “And I, behold, I have taken your [= Aaron and his sons] brethren the Levites from among [the] children of Israel; [they are] a gift to you [= Aaron and his sons] given to YHWH, to attend to [the] service of [the] tent of meeting.”

Num 18:7, “And you [= Aaron] and your sons with you shall keep your priesthood for everything pertaining to the altar and for that behind [the] veil, and you shall serve. I give your priesthood [to you as] a service of gift. And the layman/outsider [2114 *zar*] who comes near shall be put to death.”

It is seen here that only Aaron and his sons may be priests, and all Levites who are not descended from Aaron are to serve under the authority of the priests. Certain duties are exclusive to priests and other duties are for other Levites under the direction of the priests. Here a non-Aaronite is referred to as a layman/outsider [2114 *zar*], and if such a person attempts to come near (get close, meddle, or interfere), death shall be the punishment. The Hebrew

word *zar* is discussed on page 279 of HALOT where several meanings are supplied based on the context, and Num 3:10; 18:7 are listed under the general meaning “unauthorized person”, and for these verses the sub-meaning “not an Aaronite” is stated in HALOT.

D. Punishment by Death for Usurping the Domain of the Aaronic Priesthood

Note the following references that show the teaching authority given to the priests.

Num 3:10; 18:7 show punishment by death for violating the domain of the Aaronic Priesthood. An example of this punishment by death is seen in II Sam 6:1-8; I Chr 13:7-11. The key passage follows.

II Sam 6:6, “And when they came to Nachon's threshing floor, Uzzah put forth [his hand] to the ark of the Almighty and took hold of it because the oxen shook it.”

II Sam 6:7, “Then [the] anger of YHWH flared up against Uzzah and the Almighty struck him there for [his] error. And he died there by [the] ark of the Almighty.”

This type of event is unique, but the lesson is clear even though no other example is available. If some item, such as the two silver trumpets in Num 10:1-10, has a holy use for the priests alone, then anyone having the fear of the Almighty should refrain from meddling with it. To do so is a usurpation of authority.

E. The Teaching Authority Given to the Levitical Priesthood.

Lev 10:8, “And YHWH spoke to Aaron saying,”

Lev 10:9, “you shall not drink wine or strong drink, you nor your sons with you when you go into [the] tent of meeting so that you shall not die; [it shall be] an everlasting statute for your generations”

Lev 10:10, “so that you may distinguish between the holy and between the common, and between the the unclean and between the clean,”

Lev 10:11, “so that you [= the Aaronic priesthood] may teach [the] children of Israel all the statutes which YHWH has spoken to them by [the] hand of Moses.”

Deut 24:8, “Take heed in an outbreak of leprosy, that you carefully observe and do according to all that the priests, the Levites, shall teach you as I commanded them, so you shall be careful to do.”

Jer 18:18, “... for the law shall not perish from the priest, or advice from the wise, or a word from a prophet.”

Mal 2:7, “For [the] lips of a priest should keep knowledge, and [people] should seek [the] law from his mouth, for he [is the] messenger of YHWH of hosts.”

Note that from the wording of Deut 24:8, it is accepted that when the populace is taught the law by a priest, they are expected to do what the law says, and this gives authority to the priest.

Despite the above wording that shows the general summarized impression that the priesthood was expected to teach the people the law of Moses, this function was not exclusive to the priesthood alone, as can be seen from the Torah next.

Deut 31:9, “And Moses wrote this law and he gave [it] to the priests, [the] sons of Levi who bore [the] ark of [the] covenant of YHWH, and to all [the] elders of Israel.”

Deut 31:10, “And Moses commanded them [= priests, Levites, and elders] saying, at [the] end of [every] seven years, at [the] appointed-time of the year of release at the feast of tabernacles”

Deut 31:11, “when all Israel comes to appear before YHWH your Almighty in [the] place that He shall choose, you shall read this law in the presence of all Israel in their ears.”

Thus the reading of the law every seventh year could be from the mouth of the priests, the Levites, and the elders, although the primary teachers of the law were shown above to be the priests.

Lev 21:10 begins with the Hebrew *v-ha-cohan ha-gadol*, which literally means “and the priest the great”, which is commonly translated “the high priest”. The Hebrew word *gadol* means “great” and it shows greatness in authority. The authority of the high priest is seen in Lev 21:10, “And the high priest among his brothers on whose head the anointing oil was poured,

and [hence] whose hand was filled to put on the garments, shall not uncover his head nor tear his garments”.

F. Ps 133 shows Calendric Unity via the Authority of the Aaronic Priesthood

Ps 133:1, “A song of the upward-steps, by David, Behold how good and how pleasant [is the] dwelling of brothers, yes-indeed in-unity.”

Ps 133:2, “[It is] like the good oil upon the head, descending upon the beard, Aaron's beard, descending upon the edge of his garments.”

Ps 133:3, “Like the dew of Hermon descending upon the mountains of Zion, because there YHWH commanded the blessing of life forever.”

Verse 2 mentions Aaron, the first high priest, who thus represents the Aaronic priesthood (Levitical priesthood). Anointing with oil upon the head bestows authority on the priest (Ex 28:41; 29:7-9; 30:30; 40:13-15). This is saying that dwelling in unity is like the oil of authority upon the Levitical priesthood, because unity can only come about if the priesthood properly teaches the law (Lev 10:8, 11; Mal 2:7) and signals the beginning of each month through their blowing of the two silver trumpets (Num 10:1-2, 8-10). Only then can there be spiritual unity, and with individual spiritual growth, the ideal outcome of this will be the blessing of eternal life (note Ps 133:3). The appointed-times, the days of holy convocation, were indirectly announced by this priesthood at the beginning of the first and seventh months. This was a means of promoting unity in collective worship and unity of the days of holy convocation. There could be no opposing opinions and disunity concerning the day of the beginning of a month because of the authority of the high priest to achieve unity. This priesthood that was used to achieve unity was only given residence within Israel (Num 35:2-8).

To speak of pleasantness in unity, as seen in verse 1, implies a mental peace that can only come by willing agreement with the decision of the priesthood (Ps 133:1-2). If knowledge to achieve spiritual unity is attained, it should produce uniformity in recognizing the days of holy convocation, the appointed-times.

Through the symbol of oil, Ps 133 shows calendric unity through the authority of the Aaronic Priesthood. Verse 1 shows that this unity is good and pleasant.

G. People involved in Israel's Governance before the Babylonian Exile

When considering the overall structure of ancient Israel's governance before the exile to Babylon, first there was a period of Judges, and then, during the life of the prophet Samuel, the period of kings began. After Solomon, the kingdom was split into the northern House of Israel and the southern House of Judah. The latter contained the capital city of Jerusalem where the king and the priestly headquarters were centered near the one and only Temple. From that time onward our interest then centers on the House of Judah alone. It is clear that Israel's governance and that of the House of Judah was intended to be a theocracy (note Deut 17:14-20). The elements of the theocracy in the House of Judah were the king, the priests, certain people who the king might appoint, and the prophets who might be unwelcome to certain sinful kings.

There were also courts to hear legal cases where parties were in dispute. Deut 17:8-13 mentions the need to judge legal cases of dispute, and those who do the judging are referred to as priests, Levites, and judges in verse 9. There is no indication in the Tanak that any calendric decision was to be treated as if it were a legal case that required some non-priestly civil court. Such a concept is contrary to the implications of Ps 133. Num 10:8, 10 mentioned above, puts jurisdiction over the calendric practice of blowing the two silver trumpets at the beginning of the months in the hands of the priesthood, and there was one high priest who had the leadership. Meddling with the duties of the priesthood by unauthorized people carried the death sentence.

There is a unique event in Num 11:16-30 that shows a selection of 70 men from among the elders of Israel. Num 11:16, 24, 25, 30 have the word *elders*, which is the Hebrew word *zaken*, having Strong's number 2205, appearing in BDB on page 278 where its first meaning is "old of human beings" and another meaning is "elders, as having authority". The meaning of *zaken* is best appreciated when one considers the nature of the chain of authority through male lineage as shown by a combination of commandments. Among the ten commandments is, "Honor your father and your mother ..." (Ex 20:12; Deut 5:16). The authority of the husband over his wife is seen in Gen 3:16; Num 30:6-16. These laws work together to imply that the oldest living male within a family's lineage has authority over the extended family, and he is thus surely an elder or *zaken*. Num 11:16 makes it clear that these 70 men were already elders before Moses began the selection, and moreover, besides being elders, they were officers. Here the

word officers is the Hebrew word *shoter*, which is Strong's number 7860, appearing in BDB on page 1009 where it states, “appar[ently] subordinate *officer*, judicial, civil, or military”. This implies that these elders have had some practical leadership or management experience, but not necessarily at the top position.

Num 11:16, “And YHWH said to Moses, Gather to Me 70 men from [the] elders of Israel whom you know to be elders of the people and its officers. And bring them to the tent of meeting, and let them stand there with you.”
Num 11:17, “And I will come down and I will speak with you there. And I will take of the Spirit that is upon you, and I will put [it] upon them, and they shall bear [the] burden of the people with you. Thus you shall not bear [the burden] yourself alone.”

No further qualifications are given concerning the selection of these 70 men from among those who were already elders. There was no tribal restriction, there was no requirement of a knowledge of the law, and there was no requirement of faith. There is never any indication in the Tanak that these elders met together as one body to discuss matters among themselves, or that they had a unified label such as a court or Sanhedrin.

In Ex 18:13-27 Moses' father-in-law gave him advice to build a pyramid organizational structure of judges, so that only the very difficult cases would filter their way up the pyramid to him. This advice did not involve previously recognized elders with leadership experience. If this advice would have succeeded, there would have been no need for the subsequent complaint by Moses in Num 11:1-15, which led to the appointment of the 70 men who were already elders.

In Num 14:26-33 the punishment of death during the 40 years of wandering in the wilderness was given to all Israelites who were 20 years old and above. This death in the wilderness came to all of the 70 elders with the exception of Joshua and Caleb, if they were among these elders. One need for elders in Israel was simply the practical function of communication of basic news to all people from a central seat of government. When Joshua crossed the Jordan River there were a few million Israelites. If Joshua himself spoke loudly, only a tiny fraction of them could hear him. Since people were geographically grouped as near relatives, the most practical way to communicate with all people was through the system of elders. Joshua would speak to the elders as heads of clans (subgroups within a tribe), and

they in turn would go to those who they represented in family ancestry and authority so that the news would reach everyone. Existing authority through male lineage was respected. Thus Josh 7:6 mentions the elders of Israel who were near Joshua. There is no need to imagine that there were 70 of them. These elders were authority figures for purposes of orderly travel and communications, and they also had ancestral authority as the oldest males in their extended family.

H. The *Mishnah* and the Great Sanhedrin

The *Mishnah* (c. 200 CE) teaches that the 70 men with Moses constituted the greater Sanhedrin where it quotes from Num 11:16 discussed above. On page 383 of Danby's translation of the *Mishnah*, in Sanhedrin 1.6, we find (with Danby's additions in square brackets), "The greater Sanhedrin was made up of one and seventy [judges] and the lesser [Sanhedrin] of three and twenty. Whence do we learn that the greater Sanhedrin should be made up of one and seventy? It is written, *Gather unto me seventy men of the elders of Israel*, and Moses added to them makes one and seventy." Although Num 35:24 mentions "the congregation shall judge", the Tanak never defines the congregation in this sense as the 70 (or 71) elders. It may refer to any court that represents the people in any area of Israel through history. The *Mishnah* interprets Num 11:16 as the first great Sanhedrin in a succession through history in order to justify a major leadership role for a body of men who are not necessarily Levites.

Deut 17:8-13 mentions the need to judge legal cases of dispute, and those who do the judging are referred to as priests, Levites, and judges in verse 9. The word *elder* is not used here, thus negating the Mishnaic supposition that a collective of 70 elders was to continuously constitute a greater Sanhedrin. If this Mishnaic interpretation were true, there would be some clear evidence of it in the Tanak, which is often occupied with political conflict. On page 382 of Danby's translation in Sanhedrin 1.2, authority to render calendric decisions is claimed for a small committee within the Sanhedrin, and there is no tribal requirement for this committee. It appears that the *Mishnah* is attempting to invent an entity that controls the calendar apart from the priesthood. As stated above, this Mishnaic concept is contradicted by Ps 133.

Positive evidence that calendric unity was only to be achieved through the authority of the Aaronic priesthood does exist in Ps 133. In that

psalm the unity of the brethren was to be achieved through the anointing oil upon Aaron's beard, which symbolizes the bestowing of authority upon that priesthood to bring about unity. This authority would be contradicted by some body of non-priests who would attempt to direct priests concerning the appropriate time to blow the two silver trumpets and declare which month is the first.

I. History of Disruption and Restoration of the Levitical Priesthood

The Levitical priesthood performed specific functions associated with the sacrificial system, the calendar, teaching the people, and they were also prominent among the judges.

As seen in Jeremiah 52, when the House of Judah was fully conquered by the Babylonians, the wealthy people of Judah were taken into exile, Solomon's Temple was destroyed, and the high priest was put to death. The disruption in the priesthood was based upon the execution of the high priest and the exile of the wealthy class rather than the destruction of Solomon's Temple. From this time onward there is no historical record of the existence of the ark. The poor people who remained in the land may have included some Levites and priests. However, Ezra 2:2, 36 shows that when Zerubbabel returned to Jerusalem to rebuild the Temple, there were priests who returned with him. We have no history that preserves exactly how the priesthood functioned during the period of exile, yet the priesthood existed without an ark and without a Temple. When the Second Temple was destroyed in 70, the priests were still known and the priesthood could have continued as it had been during the Babylonian exile when there was neither ark nor Temple. Some inventiveness could have enabled the priesthood to perform their functions because during the Second Temple period, they found some means to function without an ark during the tenth day of the seventh month, the Day of Atonement. Political considerations prevented the continuation of the priesthood, yet this was a method of fulfilling the prophecy in Mal 2:3.

There was a serious complaint against the Levitical priesthood in Mal 2. The punishment to that priesthood for its continuing sin is discussed in Mal 2:3 where the eventual sentence is: "take you [= priests] away". This language is similar to that of exile rather than a permanent abolition.

There is evidence from the Tanak that this priestly exile will be ended and the sacrificial system will be functioning again, even prior to the time of the Third Temple that is discussed in Ezek 40-48 where the Aaronic Priesthood is shown to function. This renewal of the functioning of the Aaronic priesthood is implied by the uses of the *daily-sacrifice* (Hebrew *tamid*, Strong's number 8548) in the prophecies of Daniel, especially Dan 11:31; 12:11, but also Dan 8:11, 12, 13. Through these prophecies of Daniel, the Tanak recognizes the legitimate functioning of this priesthood once again prior to the Messianic era of worldwide peace.

Thus the Aaronic Priesthood is now in a temporary exile, but not made void. During this time of exile there are no two priests to blow the two silver trumpets according to Num 10:10. No one outside the lineage of Aaron is qualified to do this. The best that could be done is to simulate the priesthood in the sense of determining what they would determine and then act accordingly. If someone would imagine differently, there is the challenge of proving who would have the authority to appoint two priests to perform this function.

J. Authority of the Levitical Priesthood Recognized in the New Testament

The apostle Paul in the New Testament recognized the authority of the Levitical priesthood. In Acts 21:26 Paul entered the Temple and participated in a ritual that required the Levitical priesthood to perform certain duties, and thus Paul recognized the authority of this priesthood. In Acts 23:5 Paul also recognized the authority of the high priest. Heb 9:7 points out that when this was written, the high priest still functioned and entered the holy of holies once per year although there was no ark, showing that this was still a continuing practice of the Levitical priesthood. Thus this priesthood was not shown disrespect by the author of the letter to the Hebrews. Heb 10:11 shows the continuation of the functions of the Levitical priesthood while the Temple still stood. The next chapter continues this subject.

[16] Control of the Temple, and thus the Calendar, in the Early First Century

When studying the history of the calendar whose roots are embedded in the Tanak, one encounters writings from the New Testament, from Josephus and from Rabbinic literature. Then the reader is faced with the problem of determining whether all the statements one finds in these sources are historically true. There is a huge time gap from the fifth century BCE when

Ezra and Nehemiah lived to the first century environment of the New Testament. Josephus was born in 37 CE, and while he wrote about events in the prior century, his sources from that time are not subject to independent checks for accuracy. Undoubtedly there were elderly folk who could give him personal recollections from the decades prior to his birth. Due to the difficulty in verifying information in Josephus from before the first century, our attention from his writings will be confined to the first century.

(A) Primary Sources of History in the early First Century

In analyzing who controlled the Temple before the war between the Romans and the Jews broke out in 66, the major primary sources are the New Testament and Josephus, and the question of whether the Rabbinic texts that begin with the *Mishnah* (c. 200 CE) are to be properly accepted as primary sources deserves some initial brief comment. From the destruction of the Temple in Jerusalem in 70 CE to the publication of the *Mishnah* c. 200 CE is 130 years. While the authors of the New Testament were personal witnesses of what they wrote (though Mark and Luke received their information from others who were personal witnesses) and Josephus was a personal witness beginning about the middle of the first century (he was born in 37 CE, but utilized other historians before him, especially Nicolaus of Damascus for events in the second century BCE), the *Mishnah* was not set into its written form by anyone who was a personal witnesses of events before 70 or who personally knew anyone who was such a personal witness. Except for some relatively few apparent borrowings from the *Megillat Taanit* (published c. 120), it is not known how the infrequent historical statements in the *Mishnah* and later Rabbinic texts from before the destruction of the Temple have found their way into those texts.

However, by comparing certain statements in these three sources with one another that relate to authority in Judea during the time sought, and by supplementing this with a few remarks from the Roman historians Tacitus and Trogus, we can make a reasoned evaluation on whether the use of the *Mishnah* and later Rabbinic texts are reliable as a historical source of events from before 70. In any case, the *Mishnah* falls short of being a primary source because it was not put into published form close to the time of the events we now seek (before 70 CE), and we have no record of any primary sources that it utilizes except for the *Megillat Taanit*, which is only a very condensed skeleton of some events, and which was completed c. 120.

Rabbinic texts may have used some primary sources for its historical statements, but this is evaluated in appendix B.

In the present discussion our interest lies in which groups of Jews controlled the Temple services, especially during the first century before the war began in 66. The New Testament mentions the high priest, chief priests, Sadducees, Pharisees, and scribes. Josephus mentions these groups also, but adds the Essenes and the zealots. Since the latter two groups are never mentioned in the New Testament, they should be dismissed as candidates for having control of the Temple in the 70 years before its destruction.

(B) Branches of Modern Judaism relate to evidence on this Issue

Jewish scholars are biased in their writings and opinions, and it is important to address this in order to warn the reader concerning the literature on this subject. Scholars may be grouped based on their personal religious affinity, and this is sometimes reflected in their writing even though they may carefully avoid telling the audience their religious outlook.

Modern Judaism is divided into many groups, but these may be roughly categorized into four divisions based upon their attitude toward the Pentateuch and the Talmud. My summary is somewhat oversimplified and it pertains to the culture within the United States rather than modern Israel, but growing up as a Conservative Jew in New York City and having a grass-roots feel from personal contacts, in my opinion it is not very far off base. Certainly not all individuals within these groups conform to the characteristics to be described next, but these characterizations do approximately reflect the historical development of these divisions and the views of some major scholars from these groups. Jewish laymen sometimes tend to be more idealistic and less studied in the details of their religion, so that many of them are less likely to fit the broad description than the knowledgeable students and scholarly representatives. In discussing these divisions, the major emphasis will be on their attitude toward the law of Moses, and that is the reason for limiting the discussion to the Pentateuch within the Tanak. All of the divisions of Judaism consider the entire Tanak to be a sacred document of their religion.

The first division is Orthodox Judaism, which treats both the Pentateuch and the Talmud as inspired, and accepts the laws of the Pentateuch as they are interpreted in the Talmud. The second division, Conservative Judaism, treats

both the Pentateuch and the Talmud as sacred documents of their faith, but regards common views of archaeological interpretation as well as secular history and biblical textual criticism as valid sources for occasionally modifying their reliance on the Pentateuch and the Talmud as representing correct history. Adherents of Conservative Judaism tend to be less strict in their observance of the laws than Orthodox Jews, and their knowledge of the Talmud (excluding Conservative scholars) is typically significantly less than that of Orthodox Jews. Adherents of Conservative Judaism generally do not accept the legal interpretations of the Talmud to be authoritative in theory or in practice in their lives. The third division, Reformed Judaism, treats the Pentateuch as a sacred document, but not the Talmud. Reformed Jews regard the laws of the Pentateuch to be interpreted figuratively or allegorically, and to be applied in a changeable way according to the times. From a literal standpoint Reformed Jews are the least observant of the laws of the Pentateuch. Reformed Jews do not regard the Pentateuch as depicting correct history. The fourth division, Karaite Judaism, treats the Pentateuch as inspired, but the Talmud is not considered to be a sacred document. Karaites interpret the laws of the Pentateuch in a literal way, and they are strict in observing them. Karaism is the smallest of the four divisions in numbers of adherents, and their interpretation of the laws is not uniform amongst themselves. Orthodox Judaism and Karaite Judaism both represent Jewish fundamentalism, but the latter discard Talmudic interpretation.

It is to be expected that a scholar who was reared in Judaism will be biased toward the Talmud according to that rearing. Only Orthodox scholars will be heavily motivated to treat the Talmud as representing true history, although a minority of Conservative scholars will write in such a fashion that they will often appear to masquerade as Orthodox Jews. If one examines a book, a paper, or an article in an encyclopedia that was written by an Orthodox Jew, one can expect that author to use the Talmud heavily as accurate history. All Jewish scholars will downplay the New Testament. Within their writings, Jewish scholars very rarely label themselves according to their specific Jewish upbringing, but the reader who examines their works can usually decide whether or not each one appears to favor the Orthodox position. It is important to make some judgment about an author's position because bias plays a role when the reader is trying to determine which position represents correct history. It is possible to use certain criteria in order to judge whether it makes sense to treat the Talmud as if it was inspired, which is the accepted position of Orthodox Jews.

If two laymen are debating an issue and one of them uses an opinion by an implicit Orthodox Jewish scholar while the other uses a differing opinion by a Conservative Jewish scholar, the two laymen will not be able to agree because the sources that they each favor are in disagreement. That is the reason why it is so important to go back to the primary sources and discuss the place of the Talmud for historical purposes before the Temple was destroyed. After this is done and after the bias of a scholar is identified, one will know how to weigh that author's writings.

(C) The New Testament as a Primary Source

The writers of the New Testament were convicted to motivate its readers to seek eternal life according to the faith they had come to accept, but except for Paul who declared himself to be a Pharisee (Acts 23:6; 26:5; Phil 3:5), there is no clear evidence that they were personally biased for or against the Pharisees compared to the Sadducees in the subject of who controlled the Temple. Josephus devoted more personal attention to the politics of the groups and was involved in politics, so he should be expected to be far more biased than the writers of the New Testament. We will consider the matter of the bias of Josephus to some degree. From these considerations it should be clear that the most important primary source of historical information from before the Temple was destroyed in 70 CE is the New Testament, so this will be discussed first.

Obviously, favoring one primary source will produce conclusions that are biased toward that source. Any author who arrives at conclusions has no choice but to favor some source after giving reasons. Both Sadducees and Pharisees are condemned in the New Testament in the sense of having incorrect teachings (Mat 16:6, 11-12). Thus, according to the writers of the New Testament, one cannot look to either of these groups as having the original biblically correct understanding of some particular teaching of the Tanak merely because of the label *Sadducee* or *Pharisee* attached to the doctrinal opinion.

(D) Many of the Scribes were Sadducees. Mat 23:2 and Moses' Seat

Luke 20:27 [NKJV], "Then some of the Sadducees, who deny that there is a resurrection, came to [Him] and asked Him,
Luke 20:28, saying: 'Teacher, Moses wrote to us [that] if a man's brother dies, having a wife, and he dies without children, his brother should take his

wife and raise up offspring for his brother.” [Speech continues through verse 33]

Luke 20:34 [Response to the Sadducees], “The sons of this age marry and are given in marriage.” [Speech continues through verse 38]

Luke 20:39, “Then some of the scribes answered and said, ‘Teacher, You have answered well.’

Luke 20:40, But after that they dared not question Him anymore.”

From verse 39 it is clear that scribes had been there all along, and from verses 27 and 40 it is clear that these scribes were Sadducees. In fact the Sadducees would not have asked Him this sensitive question if Pharisees had been present because that would have immediately sparked a heated debate between the two groups over their difference on this issue.

Acts 23:9 makes it clear that some scribes were Pharisees. Hence scribes included some Sadducees and some Pharisees.

On page 22 of Bar-Ilan we find the following paragraph: “Most of the scribes of the end of the Second Temple period whose genealogy is known were priests: Yosef (T. Shabbat 13:11), Yohanan (P. T. Maaser Sheni 5:4, 56c), Beit Kadros (T. Menahot 13:19), Josephus and others. It is clear that during the time of the Temple, priests, some of whom were scribes, used to manage the Temple property, contributions and gifts in addition to annual tithes (Neh 13:13; T. Shekalim 2:14-15; Josephus, War 6:387-91). The Temple as the official cultural-religious center was also the center of the knowledge of reading and writing, and because of that the priests in charge of the Temple were evidently responsible for the preservation of the Tora, its copying in general and the scribal profession in particular.” Thus in the view of Bar-Ilan, a historical expert in the realm of scribes and priests in the first century, we see the priests in charge of the Temple and the scribes heavily represented by priests. Some writers have been unaware of the representation of priests among the scribes and have given a distorted picture of Mat 23:2.

Acts 5:17 [NKJV], “Then the high priest rose up, and all those who [were] with him (which is the sect of the Sadducees), and they were filled with indignation.” This shows the chief priests to be included within the Sadducees at that time, although it is unclear how many Sadducees might be from outside the priesthood.

Thus, when we see Mat 23:2 [NASB], “The scribes and the Pharisees have seated themselves in the chair of Moses”, the scribes are mentioned first, and they have a major representation from among priests, which were seen to be closely equated with or within the Sadducees. Hence Matthew is not excluding the Sadducees from Moses’ seat, and the mention of Scribes (which includes Sadducees) comes first. There are three primary biblical functions of the Levitical priesthood. The first concerns the performance of the sacrificial system including personal counseling with those who bring sacrifices for personal reasons (such as to atone for their sins) and rituals at the sacred altar for the holy days, the Sabbaths, the new moons, and the daily sacrifices. The second concerns teaching the law to the people, which is shown in Mal 2:7 and Heb 7:11. The third concerns the prominent role of the priests and Levites throughout the court system of Israel according to the law of Moses (Deut 17:9; 19:17; 21:5). Thus the priests were to officiate at the holy altar, teach the people, and judge legal cases.

Let us consider the meaning of “Moses' chair or seat” from Mat 23:2. Moses did have the supreme role in the first primitive court of one judge in Israel. In Ex 18:13-26 we see the role of Moses as the civil judge rather than in the role of communicating the law to the people. Ex 18:13 has the expression “Moses sat to judge the people”. This sitting implies a chair or seat of office for judging. The Hebrew word *shaar*, Strong's number 8179, is normally translated gate, but it sometimes means “court”. Deut 16:18 [NKJV], “You shall appoint judges and officers in all your gates [courts]...” Amos 5:15 [NKJV], “Hate evil, love good; establish justice in the gate [court]”. On page 1045 of BDB the second meaning of this word is “space inside gate, as public meeting-place, market”, and within this category, BDB later adds “where elders, judges, king, sat officially”. Examples of sitting in the gate (meaning court) include Gen 19:1; Ruth 4:1-2; II Sam 19:8; I Ki 22:10; II Chr 18:9; Est 2:19, 21; Job 29:7; Prov 31:23; Jer 38:7. The advice of Moses' father-in-law in Ex 18:13-26 was a pyramid structure of judges, but in Num 11:16-17, 24-25 this pyramid structure was replaced by a flat structure (equal authority) of 70 men from among the elders of the people. See the prior chapter titled, “Authority of the Levitical Priesthood from the Tanak” for more detail on this. At the end of the 40 years in the wilderness, more details about the future court system were revealed in Deuteronomy, where Deut 17:9; 19:17; 21:5 show the prominent role of the priests and Levites throughout the court system of Israel according to the law of Moses.

From biblical examples, Moses' chair or seat sensibly means the official seat from which civil case judgment comes, a judicial function, not a legislative function. This is neither the changing of existing laws, nor the legislation of new laws, but the application of existing laws to specific cases in dispute between relevant parties who seek to bring their case to a civil court. Priests would not consider their procedures to be under the jurisdiction of a civil court. Civil justice of disputes does not include the methods and rules whereby the priests carried out their functions, which were not civil disputes in nature. This reasoning only considers the context of the Tanak applied to Mat 23:2, so the question remains as to whether, in the first century, an expanded jurisdiction existed for the main Sanhedrin in Jerusalem, in which it is assumed that Moses' seat was exercised. In a religious society certain aspects of civil laws must be derived from the law of Moses as it was understood in their day, but the question remains concerning whether the central Sanhedrin had a legislative function at all. The Sanhedrin will have to be discussed in more detail.

(E) Sanhedrin in the New Testament

The Greek word *sunedrion* for sanhedrin, Strong's number 4892, occurs 22 times in the New Testament. These are Mat 5:22; 10:17; 26:59; Mark 13:9; 14:55; 15:1; Lk 22:66; John 11:47; Acts 4:15; 5:21, 27, 34, 41; 6:12, 15; 22:30; 23:1, 6, 15, 20, 28; 24:20. In three of these places (Mat 5:22; 10:17; Mark 13:9) a local court is the meaning, but in all other 19 cases this is the Sanhedrin in Jerusalem associated with the Temple. In 17 of these 19 cases the Greek definite article is used, which implies that there is only one Sanhedrin associated with the Temple. The two exceptions without the definite article are Mark 15:1 and John 11:47. The context of all 22 places is consistent in showing a civil court where accusation against a party is made, witnesses for or against that party are questioned, the accused party is questioned, and a judgment for or against that party is rendered. Except for Acts 23 where the outsider Paul introduced the doctrinal issue of the resurrection from the dead in order to cause strife and detract attention from his own case, in none of the meetings of the Sanhedrin associated with the Temple do we encounter a debate over the application of the law of Moses or the meaning of the Scripture. In the only examples available, the Sanhedrin appears to be a civil court in which civil cases are relevant, not an environment for the debate over biblical doctrine. The Sadducees and Pharisees appear to try to get along with one another peaceably within the Sanhedrin, except for the case in which Paul caused a stir over doctrine. The

conclusion from the New Testament is that the Sanhedrin in Jerusalem associated with the Temple acted as the supreme court to hear cases, but did not engage in legislating new additions to the law of Moses.

(F) The Parable of the Wicked Vinedressers

Luke spent considerable time with Paul (a former Pharisee) - see Col 4:14; II Tim 4:11 and the “we” portions of Acts that includes the presence of Luke as the author - Acts 16:10-17; 20:5 - 21:13; 27:1 - 28:16. Luke partially relied on Paul for some of the relations between the leaders of the Jews when he wrote. Paul, having been a Pharisee and having lived in Jerusalem, would have been an excellent first hand source of extra background information for Luke's writings.

Luke 20:9 [NKJV], “Then He began to tell the people this parable: A certain man planted a vineyard, leased it to vinedressers, and went into a far country for a long time.”

Luke 20:10, “... the vinedressers beat him ...”

Luke 20:11, “... they [the vinedressers] beat him also ...”

Luke 20:12, “... they [the vinedressers] wounded him also ...”

Luke 20:13, “... I will send My beloved son ...”

Luke 20:14, “... vinedressers ... reasoned among themselves ... let us kill him.”

Luke 20:15, “... they [the vinedressers] ... killed [him]. Therefore what will the owner of the vineyard do to them?”

Luke 20:16, “He will come and destroy those vinedressers and give the vineyard to others. And when they heard [it] they said. Certainly not!”

Luke 20:17, “Then He looked at them and said, What then is this that is written: The stone which the builders rejected Has become the chief cornerstone!”

Luke 20:18, “Whoever falls on that stone will be broken; but on whomever it falls, it will grind to powder.”

Luke 20:19, “And the chief priests and the scribes that very hour sought to lay hands on Him, but they feared the people - for they knew He had spoken this parable against them.”

The parallel passage in Mark starts in Mark 11:27 where it mentions, “the chief priests, the scribes, and the elders came to Him”. The continuous flow of the narrative goes down to Mark 12:12, “And they [chief priests, scribes,

and elders] sought to lay hands on Him, but they feared the multitude, for they knew He had spoken the parable against them.”

The parallel passage in Matthew begins in Mat 21:33 and ends in Mat 21:45-46, “Now when the chief priests and Pharisees heard His parables, they perceived that He was speaking of them, but when they sought to lay hands on Him, they feared the multitudes, because they took Him for a prophet.”

In this parable the phrase, “the stone which the builders rejected” is mentioned in Mat 21:42; Mark 12:10; Luke 20:17 directly before the conclusion which shows that the leaders of Israel correctly perceived He was talking about them as the builders who rejected Him (the stone), and also about them as the vinedressers who killed Him (the son). Israel is the vineyard.

In the midst of the conclusion to this parable, when He says, in Mat 21:43, “the kingdom will be taken from you”, it is clear that He is agreeing with their interpretation that they are the leaders and that the kingdom refers to Israel and especially its government.

Luke says, “chief priests and scribes”. Mark says, “chief priests, scribes, and elders”. Matthew says, “chief priests and Pharisees”. Despite these differences, all three mention chief priests first. These leaders understood that they themselves were the vinedressers in the parable, and the vineyard was Israel. Thus the parable teaches that at the general time of the crucifixion, the leading position among Jews in Judea was in the hands of the chief priests, which were Sadducees, but the Pharisees also had some leadership. This is the clearest statement of which group held the leading position from the standpoint of the seat of semi-autonomous government permitted by the Jews under the Roman Empire.

(G) How the High Priest Spoke to the Audience that included the Pharisees

John 11:47 [NKJV], “Then the chief priests and the Pharisees gathered a council and said, What shall we do? For this Man works many signs.”

John 11:48, “If we let Him alone like this, everyone will believe in Him, and the Romans will come and take away both our place and nation.”

John 11:49, “And one of them, Caiaphas, being high priest that year, said to them, You know nothing at all, ...”

For the high priest to say to his audience that included the Pharisees, “you know nothing at all”, it seems obvious that he had no fear of the Pharisees and there could hardly be any substance to the idea that the Pharisees had so much authority over the Temple that they could push him around as they might choose.

(H) Pilate's Understanding of the Chief Priests' Authority

Mark 15:10 [NKJV], “For he [Pilate] knew that the chief priests had handed Him over because of envy.”

If the chief priests did not have primary authority, but instead the Pharisees controlled the Temple area, the chief priests would have had less reason to be envious of the authority exercised by the Nazarene through the miracles. Instead the Pharisees would have played a more prominent role during the trial due to their authority, and the Pharisees would have shown envy. Note that Mark 15:10 does not say, “The Pharisees had handed Him over”, but instead, “the chief priests had handed Him over”. The last two times in Matthew that the Pharisees are mentioned are Mat 23:39; 27:62, but the trial occurred between these places. The last time that the Pharisees are mentioned in the other three Gospels are Mk 12:13; Lk 19:39; John 18:3, but these are all before the trial began. Thus the Pharisees by name seem totally absent from the trial.

(I) The Role of Gamaliel

Acts 5:34 [NKJV], “Then one in the council [= Sanhedrin] stood up, a Pharisee named Gamaliel ...”

If Gamaliel was the presiding officer of the Sanhedrin this would not merely say “one in the Sanhedrin”. The language of the New Testament shows that Gamaliel was not the head of the Sanhedrin. Appendix A refers to the *Babylonian Talmud* concerning the title *nasi* and Gamaliel along with others in his lineage.

(J) Legal Authority of the Chief Priests

Paul lets his audience know of his background as a Pharisee in Acts 23:6; 26:5; Phil 3:5, and as a former student of the Pharisee Gamaliel in Acts 22:3.

If Paul had a choice in seeking credentials for authority, he would naturally seek it from among the Pharisees rather than the high priest or the chief priests who were of the Sadducees. Here is what we find when we see where Paul went for authority. Acts 9:1-2 [NKJV], “Then Saul ... went to the high priest and asked letters from him to the synagogues of Damascus so that if he found any who were of the Way, whether men or women, he might bring them bound to Jerusalem.” Acts 9:14, “Ananias said, And here he [Paul] has authority from the chief priests to bind all who call upon Your name.” Acts 26:10, “This I [Paul] also did in Jerusalem, and many of the saints I shut up in prison, having received authority from the chief priests; and when they were put to death, I cast my vote against them.” In Acts 26:12, “While thus occupied, as I journeyed to Damascus with authority and commission from the chief priests...” We see that Paul does not go to any supposed Pharisaic leader for legal authority, but rather to the chief priests. Paul's personal identification with the Pharisees would have caused him to go to the Pharisees for authority if they could give it.

Acts 22:30 [NKJV], “The next day, because he [the Roman commander] wanted to know for certain why he [Paul] was accused by the Jews, he released him from his bonds, and commanded the chief priests and all their council [= Sanhedrin] to appear, and brought Paul down and set him before them.” Here the Roman commander shows that he understands “their Sanhedrin” to be that of the chief priests despite the fact that in Acts 23:6 Paul perceives that both Sadducees and Pharisees were present. Thus the chief priests were dominant.

The Pharisees did have sufficient clout in the local synagogues that they could excommunicate Jews from the life of the synagogue provided there was reasonable cause (John 9:13, 21-22, 34; 12:42). However, the synagogue environment is not the Temple where the chief priests (Sadducees) were dominant.

(K) Conclusion from the New Testament

The evidence from the New Testament has been given, and the Sadducees including the high priest and chief priests are clearly dominant concerning the overall political control of civil government from the semi-autonomous viewpoint that the Romans permitted. Qualification to the Levitical priesthood was a matter of heredity, not learning, and not popular support. Since only the priesthood was permitted to carry out the Temple services

commanded in Scripture, and the priesthood was associated with the Sadducees, we would conclude that the Sadducees dominated the control of the Temple services. But there is still a need to discuss Josephus and the Rabbinic texts.

(L) The Roman Historian Tacitus

Scholars estimate that Tacitus was perhaps 15 to 20 years younger than Josephus. He wrote most of his history while Josephus was still alive. He wrote in Latin, the common language of the city of Rome, and had records from the library at Rome as references. In Tacitus' History 5:8 (page 662), he wrote, "A great part of Judaea consists of scattered villages. They also have towns. Jerusalem is the capital. There stood a temple of immense wealth." Later in the same section and page he continues, "The Macedonian power [Alexander the Great and the Greek generals that succeeded him] was now weak, while the Parthian had not yet reached its full strength, and, as the Romans were still far off [in time and distance], the Jews chose kings [the Maccabean dynasty] for themselves. [Foreigners were] Expelled by the fickle populace, and regaining their throne by force of arms, these [Maccabean] princes, while they ventured on the wholesale banishment of [some of] their subjects, on the destruction of cities, on the murder of brothers, wives, and parents, and other usual atrocities of despots, fostered the national superstition [Judaism] by appropriating the dignity of the priesthood as the support of their political power."

This negative account of the Jews by Tacitus after their four-year war with the Romans ending in 70 CE (ending in 73 in Masada) does attribute political power of the Jews to the priesthood as Rome saw the situation while the Temple stood. Since the successive governors of Judea were appointed by the Roman government from 6 CE until the war broke out in 66, this view by Tacitus must represent the viewpoint of the Roman governors who were there. Notice the attitude of the Roman governor Pilate in Mat 27:24 [NKJV], "When Pilate saw that he could not prevail at all [in front of the large crowd of Jews], but rather that a tumult was rising, he took water and washed his hands before the multitude, saying, 'I am innocent of the blood of this just Person.'" Mark 15:15 declares that Pilate wanted to gratify the crowd. The Roman governors recognized the priesthood as having legal status over the Jews, and they backed up the priesthood with their authority in order to keep the Jews stable and the taxes to Rome flowing steadily. According to Josephus these governors sometimes changed

high priests as they saw fit. Even John 11:49 states, “Caiaphas, being high priest that year”, thus implying frequent changes in the priesthood. At the very top Rome was in charge, but Rome used its governor to control matters through the high priest. Rome backed the priesthood to keep the country stable. When the Temple was destroyed and Rome was angry with the Jews for starting the fighting that began the war, Rome no longer backed the priesthood. We see that Tacitus agrees with the conclusion of the New Testament.

(M) The Roman Historian Pompeius Trogus

The third generation Roman citizen Pompeius Trogus wrote a history in Latin c. 20. (see pages 2-3 of Yardley and Develin). At some time within the next 200 years a person named Justin wrote excerpts from Trogus’ history, and these excerpts survive in Latin (pages 2-6). The well known early church father Augustine (c. 400) wrote that Justin wrote a brief history following Trogus (page 6). On page 230 we find this translation of 2:16, “After Moses his son, Arruas, was made priest in charge of the Egyptian objects of worship, and soon afterwards king. And ever after that it was the practice amongst the Jews for their kings to be their priests as well. This integration of their judicial and religious systems made the Jews unbelievably powerful.” The following comment on this statement appears on page 241 of Stern, “Pompeius Trogus anachronistically depicts all Jewish history according to the conditions that prevailed during the Hasmonaean [Maccabean] monarchy, when the king and the high priest were the same person; ...” This excerpt from Trogus, who wrote in the early first century, shows that he understood the Levitical priests to exercise the judicial function. This independent primary witness agrees with Tacitus and the New Testament in attributing primacy of Jewish authority to the priests.

[17] Appointed-times and Years are known from Lights in the Sky

Gen 1:14-15 will now be examined to show that appointed-times and years are determined from lights in the sky.

Gen 1:14, “And the Almighty said: Let there be lights [3974 *mahohr*] in the expanse of the heavens to separate between the daytime and between the night, and let them be for signs, and for appointed-times [4150 *moed*], and for days and years.”

Gen 1:15, “And let them be for lights [3974 *mahohr*] in the expanse of the heavens to give light on the earth, and it was so.”

In verse 15 the word “them” refers back to the subject in verse 14, namely the lights. Thus verse 15 is saying in essence, “let the lights be for lights ... to give light on the earth”. Even the names of the heavenly bodies are absent to put emphasis on the “light bringing” purpose and mission of these heavenly bodies to fulfill the need to determine “signs, appointed-times, days, and years”. The triply emphasized mission of light from the heavenly bodies to supply light to determine appointed-times and years must be given its appropriate place in thought and use.

The word “signs” [226 *oht*] in Gen 1:14 is used for the rainbow in Gen 9:12-13, for the ten plagues in Egypt, for the Sabbath in Ex 31:13, 17, for a miracle in Judg 6:17, for the prediction of two deaths in I Sam 2:34, and in other ways. Gen 1:14 is saying that the lights in the heavens are examples of signs. Carefully reread Gen 1:14 to note that it is not saying that signs [226 *oht*] are to determine the appointed-times and years. The subject of the sentence is the lights in the sky, not the signs. The lights in the sky determine signs. The lights in the sky determine appointed-times. The lights in the sky determine days. The lights in the sky determine years. Verse 15 shows that it is some aspect of the light from these lights in the sky that cause the determination.

For the sake of completeness and to continue to show the use of the light from these heavenly lights, here is a literal translation of Gen 1:16-18.

Gen 1:16, “And the Almighty made the two great lights [3974 *mahohr*], the greater light [3974 *mahohr*] to rule the daytime and the lesser light [3974 *mahohr*] to rule the night, and [He made] the stars [to rule the night].”

Gen 1:17, “And the Almighty set them in the expanse of the heavens to give light upon the earth”

Gen 1:18 “and to rule by daytime and by night, and to separate between the light and between the darkness.”

The nature of the rulership of the heavenly lights mentioned in verses 16-18 is the dominance of their light, which again puts emphasis on the light from these lights. At the end of verse 16, concerning the stars, I added in brackets “to rule the night” because that is exactly what is mentioned about the heavenly lights, including the stars, in verse 18.

There are people who teach that the biblical month begins at the sundown of a day when the moon cannot be seen at all. Some people will use the time of the conjunction (astronomical new moon). I will call this theory the invisible moon theory or the conjunction theory. This is contrary to the biblical emphasis and stress on the use of *light* to determine the appointed times.

On various occasions I have heard advocates of the conjunction theory claim that before the Babylonian captivity under Nebuchadnezzar, ancient Israel (specifically the House of Judah) determined the start of a month with the sundown that began a day, but the moon was invisible near that sundown. These people go on to claim that after the return from captivity under Ezra and Nehemiah, Israel, under the influence of the Babylonian calendar and Persian political dominance, no longer continued the alleged original practice since the time of Moses. To judge the rationality of this view, let us read a couple of verses from Neh 8.

Neh 8:2, "And Ezra the priest brought the law before the assembly of men and women and all who could hear with understanding on the first day of the seventh month."

Neh 8:9, "And Nehemiah who [was] the governor, and Ezra the priest the scribe, and the Levites who taught the people, said to all the people: Today is holy to YHWH your Almighty."

Since the day that is stated to be the first day of the seventh month is definitely declared to be holy, it must have been determined correctly, and this was after the return from the captivity under Ezra and Nehemiah. Hence they could not have adopted a pagan practice contrary to what was correct under the law as taught by Moses. The Levitical priesthood had the proper pattern to determine the start of a month set in motion from this day onward down through the later centuries until the Temple was destroyed in 70 CE, and there is no known time during which the priesthood is thought to have had any significant doctrinal upheaval in its own ranks during this period.

[18] A Month is a Cycle of the Moon

No discussion has yet been given concerning the meaning of appointed-times in Gen 1:14.

Ps 104:19, "He made the moon [3394 *yahrayach*] for appointed-times [4150 *moed*], the sun knows its going-away."

This use of appointed-times establishes that the moon is one of the heavenly bodies specifically indicated in Gen 1:14.

I Ki 6:38, "And in the eleventh year in the month [3391 *yerach*] Bul, it [is] the eighth month [2320 *chodesh*], the house was finished for all its parts and for all its plans, thus he built it seven years."

I Ki 8:2, "And all the men of Israel were assembled toward King Solomon at the feast in the month [3391 *yerach*] Ethanim, which [is] the seventh month [2320 *chodesh*]."

Strong's number 3394 for moon (*yahrayach*) and Strong's number 3391 for month (*yerach*) have the same three Hebrew consonants and look the same when the vowel points are removed. (In the Hebrew language the 22 letters shown in the sections of Ps 119 are called consonants even though some of them act as vowels. The original Hebrew text of the Scriptures only had these 22 consonants. The vowel points (and some such marks are more than points, but that is the term by which they are called in Hebrew school) were added to aid pronunciation by the Masoretes about the year 650. This identical original appearance in the Hebrew word for moon (3394) and the Hebrew word for month (3391) shows that a biblical month is a cycle of the moon. These verses, I Ki 6:38; 8:2, also have another word for month [2320 *chodesh*], and it shows that the two different words, *yerach* and *chodesh*, indicate the same thing, a month.

[19] Full Moon occurs about the 14th and 15th Days of the Biblical Month

Ancient Semitic writings in Ugaritic that are discovered through archaeological excavations do not show the vowel signs that have been common to biblical Hebrew since c. 650 when the Masoretes added these marks to help the reader to pronounce the words. Scholars who transliterate the Ugaritic words into English letters do not add the vowels because they are not in the original writings. Scholars often write the Hebrew letter *chet* as *h* instead of *ch* as I have done. If the vowels are omitted and only one English letter is written for one Hebrew letter, the two Hebrew words for month could be written *yrh* and *hds*, instead of *yerach* and *chodesh*. In words that are cognate between Ugaritic and Hebrew, the sound for *t* in Ugaritic often replaces the sound for the letter *shin* (written *sh* or merely *s*) in

Hebrew. The Ugaritic language has the cognate words for both of the Hebrew words for month, and scholars write them *yrh* and *hdt*!!!

The Hebrew word for “day” is *yom*, and without the vowel marks, it is *ym*, The Ugaritic cognate word for “day” is also written *ym*!!!

On page 270 of the book by Pardee where he discusses the pagan context in the Ugaritic Kingdom, we find the following about the Ugaritic word *yrh*, “*yrh*, cognate with Hebrew *yareh*; ‘new moon’ is expressed by the word *hdt* alone, literally ‘newness,’ in the phrase *ym hdt*, ‘day of the new moon’; the plural *hdtm* in text 58 (RS 19.015.13) designates a series of ‘royal sacrificial feasts’ extending over an unknown number of months; ‘full moon’ is expressed by *mlat*, literally ‘fullness,’ also with the word for ‘day’ (*ym mlat*, ‘day of the full moon’); in terms of sacrifices offered, the new moon festival was less important than that of the full moon.”

On pages 271-272 of the book by Gregorio del Olmo Lete, we find the following, “According to its heading, the Ugaritic text KTU 1.109 can be defined as ‘a sacrificial new-moon ritual,’ either on a particular month or, more probably, during each month of the year. In any case, this is the only indication of *time* for the ritual act: the 14th-15th day of the month, *ym mlat* (lit.: ‘day of fullness’).” The translation of the Ugaritic text is given as follows on page 273, “On the fourteenth day the king washes (remaining) purified. On the day of the full moon two month-old head of cattle are felled as a banquet offering to Balu of Sapanu, (plus) two ewes and one ‘domestic’ dove; ...”

As was discussed near the beginning of this study, the Hebrew language of ancient Israel developed using the basic vocabulary of the language of Canaan and the nearby peoples, so that the cognate words of the same context should have the same meaning. From the Hebrew words in the Scriptures relating to the cognate words in Ugaritic, this shows that the full moon occurs near the 14th or 15th day of the biblical month.

[20] A Biblical Month is a Whole Number of Days

A cycle of the moon around the earth is about 44 minutes more than 29.5 days, but in this chapter we shall see from some verses using both of the Hebrew words for month, namely *chodesh* and *yerach*, that biblically speaking, a month is a whole number of days, with no fraction remaining. In

Judea in the first century the Jewish culture did use a common term for hour, but earlier in ancient Israel's history, there is no small subdivision of time such as hours or minutes. However, by some unknown means, the night was apparently split into three "watches" (Ex 13:34; Judg 7:19; Ps 63:6; 90:4; 119:148; Lam 2:19).

If there is always clear weather for good visibility, and the sighting of the new crescent is made from Israel, then every month should have 29 or 30, days. This is not true for all places on the earth. For example, with good visibility from southern Australia, on rare occasions there can be a 31-day month.

The literal expression *a month of days* as seen in several verses below, is idiomatically translated *a full month* in almost all translations. These examples show that a biblical month is a whole number of days.

Gen 29:14, "And he dwelt with him a month [2320 *chodesh*] of days."

Num 11:19, "You shall not eat one day, or two days, or five days, or 10 days, or 20 days,"

Num 11:20, "[but] until a month [2320 *chodesh*] of days, until it comes out from your nostrils, and it will be loathsome to you because you have rejected YHWH who is among you, and you have wept before Him saying, Why did we go out of Egypt?"

Num 11:21, "And Moses said, the people [are] 600,000 on foot among whom I am, and You said, I will give them flesh that they may eat a month [2320 *chodesh*] of days."

Deut 21:13, "and she shall put off her captive's clothing and remain in your house, and grieve for her father and mother a month [3391 *yerach*] of days. And after that you may go in to her and be her husband and she will be your wife."

II Ki 15:13, "Shallum the son of Jabesh reigned in the 39th year of Uzziah, king of Judah, and he reigned a month [3391 *yerach*] of days in Samaria."

[21] A Biblical Month has a Maximum of 30 Days

We have seen that a biblical month is a cycle of the moon around the earth, and it is a whole number of days. A cycle of the moon averages a little more than 29.5 days. Suppose the moon cannot be seen at all for some number of days when the month would normally be expected to end? How many days

can a biblical month continue if the moon is not seen at all? There is a prophetic time when the moon will not give its light.

Isa 13:9-10, “Behold the day of YHWH comes, cruel with both wrath and fierce anger, to lay the land desolate. And He will destroy its sinners from it. For the stars of heaven and their constellations will not give their light. The sun will be darkened in its going forth, and the moon will not cause its light to shine.”

Note the similarity to Joel 2:1-2; Ezek 32:7-8. The time length of the lack of light from the moon is not clear from this. All of the “day of YHWH” may be included, and the use of the word “day” here may refer to a lengthy time.

To students of biblical prophecy the context of Dan 7:21-27 fits that of the “day of YHWH”. The following begins to explain an important prophetic time period called a “time and times and half a time”.

Dan 7:25, “He shall speak pompous words against the Most High, shall persecute the saints of the Most High, and shall intend to change times and law. Then *the saints* shall be given into his hand for a time and times and half a time.”

This identical expression is also mentioned in Dan 12:7 and Rev 12:14. The context of Rev 12:14 fits perfectly with Rev 12:6, and the latter is explicitly stated to be 1260 days.

The beast of Rev 13:6 fits perfectly with the beast of Dan 7:25, which is the fourth beast in Dan 7:7-8, 19-27. The “time and times and half a time” in Dan 7:25 was already shown to refer to 1260 days. Therefore, the 42 months that are mentioned in Rev 13:4-6 is the same time period of 1260 days, which is a “time and times and half a time”.

Now “ $42 \times 30 = 1260$ ” and here “42 months is 1260 days. In this circumstance a month divides out to be 30 days. This may be explained by recognizing that the moon will not give its light, as shown above in Isa 13:9-10 and Ezek 32:7-8.

The result of this examination is the conclusion that a month is not permitted to have more than 30 days if the moon does not give its light or is not visible.

While some people may conjecture that astronomy will be altered to miraculously force a month to have 30 days at this future time, it seems more rational that the miracle of the lack of light from the moon will prevent a month from exceeding 30 days.

There is another miracle associated with “the shadow of the sun dial of Ahaz going back 10 degrees” in II Ki 20:11 and Isa 38:8. But the context associates this with the time of Sennacherib, king of Assyria, in II Ki 19:35-37; 20:6; Isa 38:6. The 14th year of Sennacherib is mentioned in both II Ki 18:13 and Isa 36:1, and secular history along with biblical reference works date this to 701 BCE. However, archaeological evidence from Babylonian cuneiform inscriptions of astronomical eclipses and other events perfectly agree with computer calculations going backwards to 747 BCE, which verify the unchanging continuation of the orbits of the heavenly bodies back to that time. This proves that the miraculous event associated with “the shadow of the sun dial of Ahaz going back 10 degrees” was a miracle as perceived by people concerning the miraculous placement of light and shadow. Although a literal translation of Isa 38:8 appears to say that the sun itself moved back 10 degrees, the context is discussing the shadow of the sun moving 10 degrees rather than the sun itself. Hence “the shadow of” should be added in italics in order to read, “So *the shadow of* the sun returned 10 degrees” in verse 8.

People have conjectured that astronomy became altered during “Joshua’s long day” (see Josh 10:12-13). The earth rotates on its axis to produce the visual effect of the sun moving around the earth. But the sun does not actually move around the earth. When Joshua requested that the sun stand still, this was according to Joshua’s perception that the sun actually moved rather than the earth rotating. In this miracle, according to the literal Hebrew wording, both the sun and the moon appeared to stop moving according to human perception, so that light would be provided for the battle. The Bible is not clear how this miracle came to pass. This may have been a miracle of light perception or light movement rather than a temporary cessation of the rotation of the earth and a temporary cessation of the movement of the moon around the earth, or some other alteration of orbits involving the sun, earth, and moon. An astronomical alteration would have required a combination of many miracles including the prevention of massive ocean floods upon many shores as well as the falling of buildings and the imbalance in standing living creatures during the massive change in bodily momentum as the

earth's rotation would have been affected. It is far more plausible that the miracle involved human perception of light rather than an alteration in the relative position of the heavenly bodies. In any case, a literal reading of Joshua's request does not take into account the reality of what happens astronomically, namely, that the earth rotates instead of the sun moving around the earth. There are great historical monuments, namely the pyramids, that bear witness to the unchanging orbit of the earth around the sun.

Pages 333, 336-337 of Lockyer show that most of the Egyptian pyramids are oriented east-west, and the two largest pyramids at Giza built by Cheops and Chephren are oriented east-west, having one wall aligned exactly east-west. Pages 63-64 of Lockyer explain that the sun's shadow on a vertical object from sunrise to sunset falls exactly east-west only on the days of the vernal equinox and the autumnal equinox. This witness of the great pyramids at Giza indicates that at the time of their construction, the orbit and axis of the earth with respect to the sun was the same as today because at the equinoxes the east-west shadow of one wall of these pyramids is perfectly aligned in the east-west direction. One would imagine that if the earth's orbit had changed due to the miracle associated with "Joshua's long day", then the alignment of these pyramids would have changed, so that one wall would no longer be aligned exactly in the east-west direction. Although Egyptian chronology remains a matter of controversy, so that it is not possible to date these pyramids with certainty, all estimates are that they were built long before the time of Moses. I would conclude that the earth's orbit did not change during the miracle of "Joshua's long day".

During the time of the flood there is another unusual association with the length of a month. Gen 7:11 mentions that the flood began on the 17th day of the second month. In Gen 8:3-4 the wording seems to imply that 150 days passed until the 17th day of the seventh month. Here five months seem to total 150 days, which divides out to 30 days per month. This may be explained by realizing that with so much water covering the earth, there would be thick clouds (with much rain at the beginning), so that when the month would normally begin, no moon could be seen to mark its beginning. Therefore, the maximum length of the month, namely 30 days, would be permitted.

The extent of a month is from one sundown to some later sundown, with a total of 29 or 30 days, at least in theory. In practice, if there is a succession

of months for which the sky is cloudy or rainy over all of Israel where people reside on days near the start of each of those months, then each of those months will have the maximum number of days per month, namely 30 days. Then, when the weather first becomes clear at the start of a month, that month may have less than 29 days to make up for the artificial prolongation of some months to 30 days.

[22] The Sun and Moon are the Primary Lights in Gen 1:14

To explain the significance of the translation “appointed-times” in Gen 1:14, let us now consider the following.

Lev 23:2, “The appointed-times [4150 *moed*] of YHWH which you shall proclaim [to be] holy convocations, My appointed-times [4150 *moed*] are these.”

Lev 23:3, “Six days work may be done, but on the seventh day is a Sabbath of rest, a holy convocation, you shall not do any work, it is a Sabbath to YHWH in all your dwellings.”

Lev 23:4, “These [are the] appointed-times [4150 *moed*] of YHWH, holy convocations which you shall proclaim in their appointed-times [4150 *moed*]:”.

These verses show that the appointed-times discussed in this chapter are days upon which there is to be a holy convocation. In Lev 23:3 note that the appointed-times include the Sabbath that repeats every seventh day. But this Sabbath example of an appointed-time [4150 *moed*] is not determined by the moon; instead it is determined by counting days, and days are determined by the alternation of darkness during the night followed by light during the day. This alternation of darkness and light is a result of the alternation of the absence and presence of the light from the sun, so that the sun is involved in determining this appointed-time, the Sabbath, but the moon is not involved for the following reason. Each month (or specific cycle of the moon) there are from one to three nights during which the moon cannot be seen at all, even with clear weather. During this period of invisibility of the moon, the days that are counted to arrive at the Sabbath have no contribution in counting light by the moon because the moon cannot be seen at that time. Notice the following description of rulership or dominance by the light of the heavenly bodies.

Ps 136:7, “To Him who made the great lights ...”

Ps 136:8, “The sun to rule in [the] daytime ...”

Ps 136:9, “The moon and the stars to rule in [the] night ...”

These verses show that the sun and moon are called the great lights, but the stars are also said to rule in the night. If it is not cloudy or rainy all night (and sometimes it is), it is possible to count the days by counting the nights during which one sees the stars as well as the daytimes during which one sees light given by the sun. However it is not possible to count days by counting the light from the moon due to its varying period of invisibility each month.

The use of the sun rather than the moon to determine the count to the Sabbath as an appointed-time, as well as calling the sun and the moon “the great lights” in Ps 136:7-9 and declaring the moon to be for appointed-times in Ps 104:19, show that the sun and moon are the major contributors as lights to determine the appointed-times.

When one considers all the lights in the sky (sun, moon, stars, planets, and comets), the stars, planets, and comets do not have a cyclical period that matches the cycle of the year on the earth. Due to precession of the equinoxes, every 1000 years the stars shift 14.1 days further away from the vernal equinox. Therefore, by eliminating the other choices from consideration, the last word in Gen 1:14, “years” must involve the sun in some way.

[23] Blowing two Silver Trumpets on the Day that Begins each Month

Num 10:1-2, “And YHWH spoke to Moses saying, Make yourself two trumpets of silver. You shall make them of a hammered piece. And they shall be for summoning the assembly and for the breaking of the camps [to prepare to travel].”

The Hebrew noun (used as a gerund) that I translated “summoning” is *meekra* and has Strong's number 4744 (see BDB page 896, column 2). The Hebrew noun that I translated “assembly” is *adah* and has Strong's number 5712 (see BDB page 417, column 1).

Num 10:8, “And Aaron's sons, the priests, shall blow with [the two silver] trumpets.”

Num 10:10, “And on [the] day of your gladness, and on your appointed-times [4150 *moed*], and on the beginnings of your months [2320 *chodesh*], you shall blow with [the two silver] trumpets over your burnt offerings and over [the] sacrifices of your peace offerings, and they shall be to you for a memorial before your Almighty; I am YHWH your Almighty.”

Two general purposes are mentioned for these two silver trumpets in verse 2: (1) summoning the assembly, and (2) for the breaking of the camps. The latter purpose is relevant during the 40 years of wandering in the wilderness when they journeyed from place to place, and they also journeyed when going to war. Whenever the relevant people were called together for the purposes mentioned in this section, the trumpets were blown in specific ways to signal the nature of the event.

This shows that the Levitical priests were to blow two silver trumpets on all the important occasions, which included the first day of each month as well as on the appointed-times, and the latter include each seventh day recurring Sabbath as shown in Lev 23:2-3.

[24] Hebrew *chodesh* refers to the Day that Begins each Month

Now compare Num 10:10 with I Chr 23:30-31.

I Chr 23:30, “and [the sons of Aaron are] to stand every morning to thank and to praise YHWH, and likewise at evening,” I Chr 23:31, “and for all the burnt offerings to YHWH for the Sabbaths, for the new-moons [2320 *chodesh*], and for the appointed-times [4150 *moed*] in the count [of animals], [according to the] ordinance concerning them continually before YHWH.”

In I Chr 23:31 above we notice that the burnt offerings on the new moons [2320 *chodesh*] are mentioned, and in Num 10:10 above we notice that the burnt offerings on the beginnings of your months [2320 *chodesh*] are mentioned. The whole phrase “beginnings of your months” appears in verse 10 compared to “new-moons” in verse 31, showing that a month begins with a new moon. Verse 31 translated this word *chodesh* as “new-moons”, while verse 10 translated the same word as “months”. Other examples also show a double meaning for this word. Some examples where *chodesh* means “month” are Gen 29:14; Num 10:11; I Ki 5:14. Some examples where *chodesh* means “new-moon” are II Ki 4:23; Ezek 46:3; Hos 2:11; Amos 8:5. The last verse indicates that in ancient Israel the new moon day was treated

as a public holiday where businesses were closed, although refraining from work on a new moon is not stated as a commandment in the law of Moses.

It has already been shown that a cycle of the heavenly body called the moon determines a month. The translation “new-moon”, but without the hyphen, is the common translation for *chodesh* when it refers to the beginning of a month. Nevertheless, one may question whether “new-moon” is the best way to translate *chodesh*. Based upon Num 10:10 one may translate this single Hebrew word as “month-start” or “new-month” since it is definitely the beginning of a month. As already seen above, the word for moon is *yahrayach* [3394], which has no resemblance to *chodesh*. No Hebrew word for the physical body called the moon has a resemblance to the Hebrew word *chodesh*.

It is only through the other Hebrew word for month, *yerach* [3391], that we have the connection to the physical body known as the moon. On this basis it would be more literal to translate the Hebrew word *chodesh* as “month-start” or “new-month”. The Hebrew noun *chodesh* [2320] has the same consonants as the Hebrew adjective *chadash* [2319] (almost always translated “new”) and the Hebrew verb *chadash* [2318] (about half the time translated “renew” and half the time “repair”). The month following any month is not a renewal of the previous month or a repair of the previous month; instead it is indeed a new month. While the translation of *chodesh* as “new-month” seems more literal and precise than “new-moon”, the latter is so firmly accepted that this will be used in the present study.

What about the suggestion to translate *chodesh* as “renewed-moon”? The moon itself is older than it was the previous month and the physical body itself is not renewed. If one wishes to make a case for translating the word *chodesh* as “renewed-moon” based upon the light from the moon, this is quite subjective because *chodesh* has the primary affinity with month, and the month is “new”, not “renewed”.

If we apply Num 10:1-2, 8, 10 to the beginnings of the months as specified in verse 10 along with “summoning the assembly” in verse 2, the following conclusion is drawn. Two priests were to blow two silver trumpets to summon the assembly and thereby announce that a new month had begun.

Deut 16:16 shows that only three times during the year all men are commanded to appear at one central place, not at the start of all the months.

Therefore, the summoning of the assembly at the beginning of their months pertained to those people that were near the one place where the two silver trumpets were blown and the sacrifices were performed, not all people throughout the nation.

Num 10:10 with Ps 133 shows the authority of the priesthood in declaring the start of each month through the blowing of the two silver trumpets. Num 28:11 also has the same phrase “and on the beginnings of your months”. The passage in Num 28:11-15 describes the burnt offerings, the grain offering, and the drink offering that is specific for the priests to perform on the beginnings of their months. At this time when the people heard the specific sound of the two silver trumpets blown by the two priests, they then knew that the ceremony of the offerings for the beginning of the month were to begin soon. This sound would summon the people who were within a reasonable distance to come and witness the priestly ceremonies associated with the beginning of the month. This would be an occasion for prayers, singing, and playing musical instruments when the priesthood fully developed the service for the beginning of the month.

[25] Isaiah 47:13, Astrologers, the Zodiac, and the meaning of *chodesh*

Isa 47:13 is a most interesting verse of Scripture because it teaches much about the Hebrew word *chodesh* and it condemns the Babylonian astrologers, as will be shown in this chapter. I will soon provide a literal translation of Isa 47:13, and one goal of this chapter is to explain why this translation is appropriate and accurate. Several of the Hebrew words with their Strong’s number are included after the corresponding English word(s) in the literal translation because they are discussed in this chapter.

First, some remarks should be made concerning the context. Isa 1:1 mentions that Isaiah’s recorded visions were during the reigns of the Judean kings Uzziah, Jotham, Ahaz, and Hezekiah. This approximates the period of Isaiah’s visions as from c. 760 to c. 700 BCE. The Neo-Assyrian period is from c. 1000 to 612 BCE, at the end of which Babylon captured the Assyrian capital of Nineveh (see page xxiv of Rochberg 2004). Hence Isaiah lived during the time of dominance by the Assyrian Empire. Isa 8:4; 10:5-6 is a prophecy that Assyria will soon conquer some of its neighbors. Isa 30:31-33 is a prophecy that Assyria will be defeated. Babylon was south of Assyria, and the Babylonian Empire eventually occupied more than the extent of the Assyrian Empire. Isa 39:5-7 is a prophecy that the House of

Judah will be defeated by Babylon. This implies that Babylon would first defeat Assyria, which fully transpired in 612 BCE. During Isaiah's lifetime, although the Assyrian Empire was politically dominant, the Babylonian Empire also existed to its south. Isa 47:1, 11 is a prophecy that eventually Babylon would be defeated, and Isa 47:13 is a taunt directed at Babylon. The "you" at the start of verse 13 is Babylon.

On page 8 of Rochberg 2004, she wrote, "The nightly watch of the sky seems to have been standard Babylonian practice since the reign of King Nabonassar (747-734 B.C.)." Recall the above remark that Isaiah's visions were from c. 760 to c. 700 BCE. On page 2 of Swerdlow 1998, he wrote, "Prognosticate by the new moon they [the Babylonian astrologers] did, and by the full moon, and by the appearance of the moon, and by eclipses of the sun and moon, and by the risings and settings and conjunctions of stars and planets, and by halos and clouds and rain and winds, in short, by anything in the heavens, astronomical or meteorological, that could be taken as ominous, a prophetic sign given by the gods." When Swerdlow began with the words "prognosticate by", he meant that based upon the conditions that prevail during the time of the events mentioned, they would make predictions about the future with the intent that they would come to pass. With this historical context in mind, here is my literal translation of Isa 47:13.

Isa 47:13, "You [Babylon] are wearied with your many consultations. Now let [the] astrologers [1895 *havar*] of [the] heavens [8064 *shamayim*] stand up and save you, those who look-intensely [2372 *chozeh*] at [the] stars, those-who-make-known [3045 *yada*] at [the] new-moons [2320 *chodesh*], what will happen to you."

The Jewish biblical scholar Ibn Ezra (1089 – 1164) wrote a commentary on the book of Isaiah, in which he wrote that the two Hebrew words together, *hovrev shamayim* [1895, 8064], mean "astrologers" (see page 216 of Ibn Ezra). This viewpoint made its way into the KJV, so that the KJV does not show the word "heavens", which is the literal meaning of *shamayim*.

The Hebrew word *havar* [1895] only occurs in this one place in the Tanak. From this Hebrew context alone, without any outside knowledge, there is insufficient information to determine the meaning of *havar* [1895]. Jerome was taught Hebrew by Jewish scholars, and he translated this from Hebrew into Latin c. 390. After his death the Roman Catholic Church accepted Jerome's translation from Hebrew to Latin (except for the Psalms) as the

Vulgate, its official text of the Old Testament, which the Jews call the Tanak in Hebrew. In the bibliography, on page 180 of the Vulgate Isaiah at Isa 47:13, we see the Latin words *augures caeli*, which means “seers of the heaven”. In Brenton for the Septuagint at Isa 47:13, the text shows the Greek *astrologoi tou ouranou*, which is translated “astrologers of the heaven”. Generally, it is recognized that Jerome’s knowledge of Hebrew was significantly better than the Septuagint translation into Greek from the Hebrew, although the Septuagint presents its own special problems because the Hebrew text from which the Septuagint was translated (this text is labeled the *Vorlage*) no longer exists. If we assume that the *Vorlage* was very close to the Septuagint that has survived, then there are many deletions and additions between the *Vorlage* and the Masoretic Text of the Tanak. The conclusions are that the *Vorlage* does not exist, and the Septuagint is not generally reliable for the purpose of determining the proper translation of the Hebrew Masoretic Text into English. With appropriate careful reasoning, there are some situations where the Septuagint can help resolve some apparently ambiguous meanings of some Hebrew words. Nevertheless, Jerome and the Septuagint agree in this instance, and these are the earliest known sources that provide a meaning of the Hebrew *havar* [1895].

Page 211 of BDB discusses *havar* [1895], and the word “astrologers” never appears in this entry, although a partially related idea is presented. BDB gives the meaning of *havar* to “divide” as a verb, but concerning this meaning BDB comments “so most [commentators], but dub. [= dubious, doubtful]”. BDB quotes one source that proposes the translation “they that divide the heavens”, but BDB gives no alternative. The fuller explanation given by BDB is “the distinguishing of signs of the zodiac, or other astrological division of the sky”. The RSV gives the translation “those who divide the heavens”, thus agreeing with this approach to the translation. BDB explains that the origin of the conjectural meaning “divide” is the similar sounding word in the Arabic language, *habara*, which means to “cut into large pieces, cut up”.

My translation from German to English from page 184 of the short article by Josua Blau has this to say about the use of the Arabic word *habara* as the explanation of the Hebrew *havar* [1895]: “However, the Arabic *habara* is based upon the explanation ‘cut’; indeed the subject of *habra* appears to be a ‘piece of meat’ and its meaning is ‘meat in (large) cut pieces’; thus one can surely not accept this explanation of [the Hebrew] *havar*.” Here Blau is emphasizing the need to have a similar context in order to reliably claim that

a word from one Semitic language is a cognate to a word from another Semitic language. The context is different, so he fully rejects the explanation “to cut”. Thus Blau rejects the basis behind the RSV translation “those who divide the heavens”.

The theory of using this Arabic word as a suggested cognate to the Hebrew word *havar* [1895] does, at least momentarily, appear to be supported by the idea of the zodiac in the explanation of BDB. In order to determine whether the zodiac lends support to using this Arabic cognate theory (to divide the heavens), it is necessary to understand the origin of the zodiac and its meaning. This needs to be compared to the time at which Isaiah prophesied (c. 760 – c. 700 BCE).

On page 31 of the book by Koch-Westenholz the term *zodiac* is defined. Her definition uses the word *ecliptic*, which is the apparent path of the sun in the sky during a complete year as observed from the earth. Constellations (recognized star groups) appear in the sky at or close to the ecliptic. Her definition of the *zodiac* is: “The ecliptic is divided into twelve equal parts, [called] the signs of the zodiac. The zodiacal *signs* are a mathematical construction and do no longer correspond to the portion of the sky occupied by the zodiacal *constellations* whose name they bear. The zodiacal signs are: Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricorn, Aquarius, and Pisces.” These signs are used in horoscopes.

Concerning the origin of the zodiac, which refers to the division of the year into 12 equal parts, each originally containing one designated constellation, but no longer tied to the current location of that constellation, here is a comment by John Britton, a specialist in ancient mathematical astronomy, especially Babylonian astronomy. On page 244 Britton 1999 wrote, “Obviously the [Babylonian System A] theory [of lunar anomaly] was invented earlier, but it [this mathematical theory of astronomy] seems unlikely to have materially predated the zodiac, which seems to have appeared between -463 and -453. On balance, if we assign its [this theory of lunar anomaly's] invention to -440 +/- 15 years, we should not be too far off.”

Here Britton estimates the origin of the zodiac as 12 equally divided signs of the year between 464 and 454 BCE. On page x of Rochberg 1998, we note the following concerning the origin of horoscopes: “The appearance of horoscopes in Babylonia at the end of the fifth century B.C. [= c. 400 BCE]

marks the point when the situation of the heavens at the time of a [person's] birth came to be regarded as significant for the future of an individual." On pages 20 and 25 Rochberg gives the year 410 BCE as the earliest known text of a horoscope. Horoscopes are based on the zodiac. Hence we see that the zodiac or horoscopes cannot be associated with any statement of Isaiah, showing a difference of 250 years. Thus the comment by BDB is out of place in its alleged association of dividing the heavens with the Hebrew word *havar* [1895]. Of course BDB was written before the date of the origin of the zodiac became known by historians of ancient astronomy. Thus BDB is out of date in this area. The origin of both the zodiac and horoscopes is ancient Babylon.

In an email sent by professor Lester Ness to the group HASTRO-L on June 17, 2004 he translated from the French on page 53 of the book by Auguste Bouche-Leclercq as follows, "However, it has been proven beyond doubt that the Egyptian zodiacs are all from the Roman period and freely imitate the Greek zodiac. At one blow, all the extravagant suppositions based upon their [the Egyptian's] supposed antiquity are destroyed." This was written to combat the erroneous claims that the zodiac originated in ancient Egypt. The Greeks copied the zodiac from the Babylonians and added some of their own ideas.

Edward Ullendorff suggested another meaning of the Hebrew word *havar* [1895] on pages 339-340 of his paper. He favored the two Hebrew words together, *hovrev shamayim* [1895, 8064], to mean "worshippers of the heavens". He claimed that the Ugaritic word *thbr* (to worship) is cognate to the Hebrew word *havar*. However, the Ugaritic context has nothing to do with signs or bodies in the heavens, so that there is no contextual link between the Ugaritic word and the Hebrew word. Besides, the writers who discuss ancient Babylonian astrology do not suggest that these astrologers worshipped the heavenly bodies. They made prognostications based upon what might be seen that was associated with the phenomena in the heavens. Deut 4:19, which emphasizes worship, is not specifically associated with ancient Babylon.

The evidence of the greater historical context of Isaiah as well as the context within Isa 47:13 along with the translation of word *havar* [1895] in the Greek Septuagint, in the Latin Vulgate from the Hebrew by Jerome, and by Abraham Ibn Ezra all agree that its meaning should be the plural noun *astrologers*, yet the literal grammatical form of *havar* is that of a verb in the

plural form. There is no good case for a different meaning based upon the context. Without the contextual evidence from historical astronomy and astrology that became available c. 2000, this might still be debatable. Today's knowledge of ancient Babylonian history make it clear that *havar* should mean “astrologers”.

On page 302 of BDB Isa 47:13 is specifically written under meaning 1c for the Hebrew word *chozeh* [2372], and this verse has this verb in its plural form immediately preceding “at [the] stars”. BDB states of this context “as stargazers, in astrology”.

Below the middle of column 1 on page 395 of BDB, Isa 47:13 is specifically written under the Hebrew word *yada* [3045], and it occurs in a plural verb form. Here BDB translates from *yada* to the end of the verse as follows, “who declare, at the new moons, of (the things) which are to come”. Here BDB translates *yada* “who declare”, but the context indicates that their declarations are predictions or prognostications.

In painstakingly crawling through Isa 47:13, at last we arrive at the primary Hebrew word that provides the reason for exploring this verse in its context in detail. That is the Hebrew word *chodesh* [2320]. Here it occurs in the plural, and it is preceded by the single letter lamed, which is a preposition that is pronounced “l”. Pronounced together it is *leh-chadasheem*.

The question arises concerning whether *leh-chadasheem* means “every month (i. e., monthly)” or “at the new moons” in Isa 47:13. Consider the following factors.

(1) This plural form of *chodesh* with this preposition lamed occurs in five other places in the Tanak. These are I Chr 23:31; II Chr 2:4; 8:13; 31:3; Ezra 3:5. This preposition is flexible and its meaning depends on the context. It often means *at, for, or on*”. In all six cases (Isa 47:13 being the sixth case) it may be consistently translated “at [the] new-moons”. In the five examples outside Isaiah the context prevents it from meaning “every month”.

(2) The translation “every month” is usually given in Num 28:14; I Chr 27:1; Est 3:7 where *chodesh* in the singular occurs twice in all three verses, and the preposition lamed is absent before these three double cases. The end of Num 28:14 literally means “month on month for [the] months of the year”. In the Hebrew it is “*chodesh* [singular] *b-chadshoh* [preposition bet

and singular] *l-chadshay* [preposition lamed and plural] *ha-shanah*". Here the plural form of *chodesh* is different from the plural form in Isa 47:13, though both have the preposition lamed. These three consistent examples show that the expression that is literally "month on month" (no lamed and no plural) means "every month"; thus there is no need for another expression to mean every month.

(3) In theoretical Hebrew grammar it would be a possibility for *leh-chadasheem* in Isa 47:13 to mean "every month", but there is no biblical context in which this is an example that is implied by the context. As already stated above, on page 395 of BDB, Isa 47:13 is quoted to end as follows: "who declare, at the new moons, of (the things) which are to come". Yet BDB contradicts itself on this, because on page 516, column 1, 9 lines from the bottom of the page, BDB states "every month" for *leh-chadasheem* in Isa 47:13. The Hebrew preposition lamed is very flexible, having a wide variety of meanings, so this is given as a grammatical possibility. Nevertheless, no known context implies that this was a method that was in fact used in the ancient Hebrew language to mean "every month".

(4) Near the beginning of this chapter quotations from Rochberg and from Swerdlow were given to show that during the era of Isaiah, on each night the Babylonian astrologers examined the sky for anything unusual, and then such unusual events were used as the basis for prognostications. It would be needlessly redundant for the end of Isa 47:13 to mean "monthly" when in fact the examination of the heavens was a nightly matter. However, prognostications were made for every new moon even if it was a very typical new moon. More emphasis was placed on the new moons because that was of central importance to the Babylonian calendar since it began each month. Translations of reports to the Assyrian kings by those who supervised the nightly watchers of the skies that includes the time of the later life of Isaiah may be found in the book by Hermann Hunger 1992. The prior quotation by Swerdlow is almost a summary of Hunger's book.

The above considerations provide good reasons to reject the proposal found in some translations that *leh-chadasheem* in Isa 47:13 means "every month". Thus the following is an accurate literal translation.

Isa 47:13, "You [Babylon] are wearied with your many consultations. Now let [the] astrologers [1895 *havar*] of [the] heavens [8064 *shamayim*] stand up and save you, those who look-intensely [2372 *chozeh*] at [the] stars, those-

who-make-known [3045 *yada*] at [the] new-moons [2320 *chodesh*], what will happen to you.”

The NRSV reaches an accurate literal sense of the whole verse. Isa 47:13 [NRSV], “You are wearied with your many consultations; let those who study the heavens stand up and save you, those who gaze at the stars and at each new moon predict what shall befall you.”

Isa 47:13 shows that the Babylonian practice of predicting the future of nations and the future of kings by what is seen in the heavens is sinful.

An example of the type of prognostication that was made by Babylonian priests is found on page 140 of Hunger 1992, catalogued as RMA 30, “If at the moon’s appearance its right horn becomes long, its left horn short: the king will conquer a land not his own.” On the same page RMA 37 has, “If at the moon’s appearance in intercalary Adar ([13th month] XII/2) its horns are pointed and (the moon) is red: the ruler will become strong and subdue the land.” More normal appearances also provided predictions.

Babylon had a pagan priesthood, which did not use two silver trumpets to announce the start of a month. The Babylonian priesthood spread into Assyria so that the border between Babylon and Assyria was somewhat artificial to their priesthood. Before Babylon conquered Assyria’s capital city, Nineveh, in 612 BCE, this priesthood performed their nightly observations of the heavens and made their first forays at mathematical astronomy. The kings of Assyria recognized the supposed powers of this priesthood and received letters from this priesthood. One letter that is labeled number 303 (also labeled Harper 894) on page 208 in the book by Pfeiffer, was sent from an authoritative priest to the king of Assyria that contains the following: “On the 30th I saw the moon, it was in a high position for the 30th day; presently it will be as high as it stands on the 2nd day. If agreeable to the king my lord, let the king wait (for a report) from the city of Ashshur. The king my lord may then determine (for us) the (first) day (of the month).” The context of this letter mentions the phrase “saw the moon” as a contrast to not seeing the moon, so that this must refer to the first sighting of the crescent by the observer. Since this mentions that the moon was seen about as high in the sky as for a second day old moon, the author suggests that the king wait for a report from another location where perhaps the moon might have been seen one day earlier. The sighting was near the end of the 30th day of the month.

Here is a similar example from page 75 of Hunger 1992, where the completion of a damaged word in square brackets is by Hunger. It is catalogued as RMA 76: “We watched on the 29th day; the clouds were den[se], we did not see the moon. We watched on the 30th day; we saw the moon, but it was (already) very high. The (weather) of the 29th day has to do with it. What is it that the king my lord says?” Here the author suggests that if the weather had been clear one day earlier, it would likely have been seen. He wants the king to decide which of the two days should start the month.

In both examples the Assyrian king was to officially declare the first day of the month on the basis of the information provided. These examples and others like them make it clear that the sighting of the new crescent began the first day of the month in Assyria and Babylon.

Because Babylonian prognostications were made for every Babylonian new moon regardless of whether anything unusual was seen at that evening, Isa 47:13 shows that the Hebrew word *chodesh*, new-moon, is also applicable to the Babylonian new moon!!! This shows that the fundamental concept that underlies the Israelite new-moon and the Babylonian new moon are the same. Since the Babylonian new moon day began with the sighting of the new crescent, provided that there was subsequent official recognition of this sighting, but without allowing a month to have more than 30 days, the same concept should apply to the biblical new-moon. Isa 47:13 is not the only evidence to be presented for this conclusion.

[26] The Biblical New Moon relates to the Sighting of the New Crescent

Without using Isa 47:13, we have seen that a month is a cycle of the moon, and the full moon typically occurs about the 14th or 15th day of the biblical month. We have also seen from Gen 1:14-18 that a month begins using the light from the moon as a visual indicator. The only visual discernible candidates for the biblical new moon that are available from this information are the old crescent and the new crescent. Isa 47:13 points to the new crescent. Gen 1:14 puts emphasis on the “lights”, that is, what can be seen.

Ancient Egypt had a civil calendar that ignored the cycle of the moon. But according to page 140 of Depuydt 1997, ancient Egypt also had a religious calendar that began its month with the morning one day after the old crescent was seen in the morning. The reason they waited until the morning

after the morning on which the old crescent was seen, is that they could not know that the old crescent was actually the old crescent until one morning later when nothing was seen. When a narrowing crescent is not especially thin, maybe it will not be the old crescent or maybe it will. This can only be known one morning later because the old crescent is, by its definition, the last of the narrowing crescents during the moon's cycle. This requirement to wait until one morning after the old crescent is one significant difference between the determination of the old crescent and the determination of the new crescent. When the new crescent is seen, it is immediately known because it had not been seen the night before.

In a previous chapter it was mentioned that the Hebrew noun *chodesh* [2320] (meaning *month* as well as *new-month* or *new-moon*) has the same consonants as the Hebrew adjective *chadash* [2319] (almost always translated “new”, and having the meaning “new”) and the Hebrew verb *chadash* [2318] (about half the time translated “renew” and half the time “repair”). Hence the collective association of *new*, *renew*, and *repair* is associated with the Hebrew word *chodesh*, rather than the concept of old, dwindling, or thinning, which is associated with the old crescent. Therefore, from the choice of the Hebrew word *chodesh* for the new-moon, it must refer to the new crescent rather than the old crescent.

An astronomical reason for a biblical month consisting of a whole number of days is that each new crescent first becomes visible close to sundown, which is the time that the Sabbath begins and a numbered day of the month begins. We thus see that from the biblical viewpoint, the average synodic month as a precise fraction of days, hours, and minutes is never hinted at in Scripture and is foreign to biblical thought.

Ezra 6:15 mentions the month Adar and Neh 6:15 mentions the month Elul. These are Hebrew transliterations of month names in the Babylonian calendar, but these verses are in the context of Jerusalem. Scripture is a witness here that ancient Israel adopted the month names of the Babylonian calendar at the time of Ezra and Nehemiah. This would cause severe confusion unless a biblical month began by the same concept as the Babylonian calendar. This evidence from Ezra 6:15 and Neh 6:15 is also in harmony with the conclusion from Isa 47:13, yet the reasoning from the books of Ezra and Nehemiah is independent of Isa 37:13. Indeed, a month in the Babylonian calendar began with the day whose beginning evening was

close to the time that the new crescent was seen in the western sky. But no month was permitted to have more than 30 days in the Babylonian calendar.

[27] Philo of Alexandria and the Jewish New Moon in the First Century

As a Jew living in Alexandria, Egypt in the early first century, Philo discusses the new moon from his Jewish perspective. On page 333 of Philo_7 (Special Laws 2:41) Philo wrote, “The third [feast recorded in the law] is the new moon which follows the conjunction of the moon with the sun.” Since this follows the conjunction, it must refer to the (visible) new crescent. On pages 391 and 393 of Philo_7 (Special Laws 2:141-142) Philo wrote, “Following the order stated above, we record the third type of feast which we proceed to explain. This is the New Moon, or the beginning of the lunar month, namely the period between one conjunction and the next, the length of which has been accurately calculated in the astronomical schools. The new moon holds its place among the feasts for many reasons. First, because it is the beginning of the month, and the beginning, both in number and in time, deserves honour. Secondly, because when it [the new moon] arrives, nothing in heaven is left without light, for while at the conjunction, when the moon is lost to sight under the sun, the side which faces earth is darkened, when the new month begins it resumes its natural brightness. The third reason is, that the stronger or more powerful element [the sun] at that time [the new moon] supplies the help [light] which is needed to the smaller and weaker [the moon]. For it is just then [at the new moon] that the sun begins to illumine the moon with the light which we perceive and the moon reveals its own beauty to the eye.”

In Alexandria, the leading center of Greek mathematical astronomy at that time, the conjunction is a well known concept to Philo, and he mentions the conjunction as a contrasting time to the new moon. It is clear that to Philo the Jew in the early first century in Alexandria, the new moon is the new crescent, and this begins the first day of the Jewish month. Evidently the Greek geometrical abstract concept of the conjunction had filtered down to the educated non-astronomer, Philo. He used this concept in writing to his audience without defining it, so he understood that his audience would also understand this term.

[28] Did the Jews use Calculation for their Calendar in the First Century?

On page 302 of Neusner's translation of the *Mishnah* the section Rosh Hashannah 2:8 appears, which is subdivided into parts "A" through "I" as follows, and Neusner wrote what is in square brackets below. This is quoted word for word.

A. A picture of the shapes of the moon did Rabban Gamaliel have on a tablet and on the wall of his upper room, which he would show ordinary folk, saying, "Did you see it like this or like that?"

B. M'SH S: Two witnesses came and said, "We saw it at dawn [on the morning of the twenty-ninth] in the east and at eve in the west."

C. Said R. Yohanan Nuri, "They are false witnesses."

D. Now when they came to Yabneh, Rabban Gamaliel accepted their testimony [assuming they erred at dawn].

E. And furthermore two came along and said, "We saw it at its proper time, but on the night of the added day it did not appear [to the court]."

F. Then Rabban Gamaliel accepted their testimony.

G. Said R. Dosa b. Harkinas, "They are false witnesses."

H. "How can they testify that a woman has given birth, when, on the very next day, her stomach is still up there between her teeth [for there was no new moon!]"

I. Said to him R. Joshua, "I can see your position."

Now I have some comments on the above.

(A) Due to the other names, this is considered to be the grandson of the Gamaliel in the NT, and this is considered by Orthodox Jews to be in the second century, perhaps about 110.

(B) The story may be invented to illustrate the stature and greatness of Gamaliel II. One cannot accept the historical truthfulness of everything in the *Mishnah*.

(C) Part A above is taken by Orthodox Jewish commentators including Maimonides to imply that Gamaliel II was able to calculate what the new moon should look like and whether it could be seen, and through his questioning of the witnesses and his calculations he could judge whether the witnesses were lying. But this is reading far too much into what is said. Assuming that this is historically true, Gamaliel may simply be trying to rattle the witnesses, so that they would not try to falsely testify. In other words, he wanted to see how confident they would be in their claim. Each year at about the same season, the angle of the new crescent would be generally the same, but not exactly the same. Thus an ignorant person would not know approximately what it ought to look like, but a knowledgeable person would know its approximate angle, although a knowledgeable person at that time in history would not know in advance whether it would be seen. On the other hand, in the majority of cases months did alternate with 29 and 30 days.

(D) This is the entire evidence that exists of the claim that in ancient times learned Jews could calculate whether the new crescent could be seen.

(E) The claim in B is false because it is not possible to see the old crescent and the new crescent so close together in time.

(F) The statement at the end of E indicates that on the next night the court was not able to see the new crescent, and this is the reason for the analogy given in part H.

(G) Parts G and I indicate that some people doubted that the alleged witnesses saw the new crescent, despite the fact that Gamaliel II accepted their testimony.

(H) The whole procedure and interest in obtaining witnesses for having seen the new moon should make it obvious that if its visibility was declared to have occurred at the end of the 29th day, then the ending month had only 29 days. Hence they were not using a calculation to determine the start of a month.

From the above, does it seem rational to accept the opinion and interpretation that in the early second century Jewish leaders could calculate whether the new crescent could be seen? Certainly not.

[29] The Biblical Year is a Whole number of Biblical Months, 12 or 13

A *tropical year* is the average time from one vernal equinox to the next vernal equinox, or equivalently, from one autumnal equinox to the next autumnal equinox. In ordinary speech this is also called the solar year, and it approximates the agricultural year without drifting away.

Since a biblical month averages about 29.5 days, a 12-month period will contain about 354 days and a 13-month period will contain about 384 days. But a tropical year contains about 365.2422 days, which is about 11 days more than 12 biblical months.

Leviticus 23 is the most concentrated single area of the Tanak dealing with calendric aspects of the festival days. Upon reading through Lev 23 it should be noted that months are never mentioned by name in this chapter, but always by numbered occurrence through the year. Thus once the first month is determined, all the other months are determined because they follow sequentially by number. The first month maintains a fixed relationship to the festivals. But now it will be shown that the festivals maintain a fixed relationship to the agricultural year in Palestine. Ex 34:22 shows that the Feast of Weeks approximates the wheat harvest. Ex 23:16 shows that the Feast of Ingathering approximates a harvest time of the year. Deut 16:13 shows that the Feast of Booths approximates a harvest time of the year, but a comparison of Ex 23:14-17 and Deut 16:16 shows that the Feast of Ingathering is the same as the Feast of Booths. Since there is no harvest in Palestine during late autumn and winter, the festivals must maintain an approximately fixed relationship to the agricultural year. Therefore, the first month must maintain an approximately fixed relationship to the agricultural year and hence the tropical year. Technically this is expressed by saying that the biblical calendar is lunar-solar in nature.

The Bible has an example of a year with 13 months, showing that the biblical year was not an exact tropical year. Here is the example. The time difference between Ezek 1:1-2 and Ezek 8:1 is the difference between month 4 day 5 in the 5th year of King Jehoiachin's exile and month 6 day 5 in the 6th year of his exile. This is 14 or 15 months depending on whether the 5th year of his exile had 12 or 13 months. If the difference is 14 months, this is about 29.5 times 14 (= 413) days with an overestimate of 30 times 14 (= 420) days. The overestimate of 420 days is 17 days short of the known events because Ezek 3:15 accounts for 7 days and Ezek 4:4-6 accounts for

390 plus 40 days, the total being 437 days. Thus the difference must have been 15 months, which is about 29.5 times 15 (= 442.5) days, just five or six days more than the known events of that time period.

If one should claim that the 5th year of the king's exile was a tropical year, and an overestimate of 366 days ("leap" year) plus 60 days (two extra months) is allowed, the total is 426 days, which is still far short of the 437 days for the known events.

Thus, although the biblical year maintains an approximately fixed relationship to the agricultural year, the example with 13 months shows that the biblical year is not an exact tropical year.

It will now be shown that a biblical year consists of a whole number of biblical months rather than a smaller subdivision such as days. A biblical reason for this is that Num 28:14 has the Hebrew expression *chodesh bh chadshoh lh chadshay ha shanah*, meaning "month by month for months of the year", but idiomatically "each month throughout the year". Also, I Chr 27:1 has the Hebrew expression *chodesh bh chodesh lh col chadshay ha shanah*, meaning "month by month for all months of the year", but idiomatically "each month throughout the whole year". The above example of a year with 13 months is further biblical evidence that a year consists of a whole number of months.

A biblical year cannot contain fewer than 12 months because Est 9:20-23, 26 maintains that each year on the 14th and 15th days of the month Adar the Jews are to celebrate the festival called Purim. Est 8:12 states that Adar is the 12th month. If a year could only have 11 months, then the Jews would be unable to celebrate Purim that year. Further evidence of a requirement of at least 12 months in the year comes from I Ki 4:7 and I Chr 27:1-15.

Hence a biblical year contains 12 months or 13 months, or approximately 354 days or 384 days. This is an illustration of the fact that the modern cultural concept of a year always having 365 or 366 days need not necessarily be practiced in some ancient societies.

In ancient Egypt, from some time onward, their civil calendar always had 365 days, which was divided up into 12 months of 30 days each plus five extra days (see page 28 of the reference by Ronald Wells). The time of the establishment of the 365-day Egyptian civil calendar has not been

convincingly proved. However, from writings that have survived from Elephantine, Egypt during Persian rulership over Egypt, the double dating scheme that equates certain dates in the Egyptian calendar with dates in the Babylonian calendar unquestionably demonstrates that from 471 BCE onward into the Middle Ages this Egyptian calendar was used (see Horn and Wood 1954, Parker 1955, and Porten 1996). Since this calendar loses about 1/4 of a day each tropical year, in 120 years it would lose about 30 days. The Egyptians certainly realized that this calendar would continuously lose time in comparison to the agricultural year, but it did not stop them from using it anyway. Furthermore, this Egyptian calendar became the preferred calendar by which the best Greek astronomers in Alexandria recorded their astronomical observations, although they knew it fell short of the tropical year, which they measured quite accurately.

The main point in all this is to emphasize that any practical ancient calendar may have a concept of a *year* associated with that calendar, so that such a calendar *year* need not equal the tropical year. As long as a society considers a calendar *year* sufficiently practical for its use, it may use such a *year* for centuries regardless of its lack of accuracy compared to the tropical year. For ease of computation in whole numbers and payment for months worked, it is convenient to use 12 months of 30 days each and thus use a civil calendar of 360 days. The existence of such a calendar *year* does not provide evidence that a tropical year ever actually contained 360 days. The only way that such a claim could be proved is if there was historical evidence that the agricultural year actually averaged 360 days over many years, or if surviving archaeological statements associated with astronomical cycles claimed or directly implied that a tropical year equaled 360 days. This question of whether there is any known evidence in man's history for a 360 day tropical year has come up twice on the web site for discussions on the history of astronomy, HASTRO-L, since I became a member in 2000, and thereby received all its emails since then. HASTRO-L is the only on-line discussion group exclusively devoted to the history of astronomy on the Internet. HASTRO-L has many active contributors who are professors of history and professors of astronomy. There is no historical evidence that a tropical year ever equaled 360 days, although there is evidence for an ancient calendar having 360 days in certain areas of the ancient Middle East.

Some people have conjectured that during the time of the biblical flood in the days of Noah, a tropical year or a biblical year had 360 days. This remains unproved speculation. Chapters 7 and 8 of Genesis do not claim that

each of the periods of time mentioned are non-overlapping, and do not claim that the sum of these time periods fully cover one exact year. The belief that a tropical year at the time of Noah had exactly 360 days is mere speculation.

[30] The Beginning of the Month and I Samuel 20

I Samuel 20 is very instructive to show how the biblical month began during the time of Samuel the prophet when King Saul reigned. It will be shown from the wording of this chapter that no calculated calendar could have been used at this time in Israel's history.

At this time of David's young adulthood, he has already experienced attempts by King Saul to kill him (I Sam 18:10-11; 19:9-10), but his very close friend Jonathan, the king's son, has great difficulty believing that his father wants to kill David. In order to convince Jonathan that Saul wants to kill David, David devises a plan to cause Saul to reveal his attitude toward David in the presence of Jonathan. Notice that this plan involves a day count of three from the following literal parts of verses.

I Sam 20:5, “until the third evening”.

I Sam 20:12, “about [this] time the third morrow”.

I Sam 20:19, “and [on the] third [day]”.

This shows their advance confidence that it would probably take two successive days for Saul's actions to bring to light his attitude toward David. They expected that Jonathan would witness two consecutive days of Saul's behavior. The context assumes that the reader will automatically understand this without any explanation. We need to carefully examine the context to note what the writer of the text expected the reader to know.

I Sam 20:5, “And David said to Jonathan, Behold, tomorrow [is a] new-moon, and I should sit with the king to eat ...”.

I Sam 20:18, “And Jonathan said to him, Tomorrow [is a] new-moon, and you will be missed because your seat will be empty”.

In these verses the word “tomorrow” is translated from the Hebrew word *machar*, Strong's number 4279. This word refers to the next daytime, which begins in the morning rather than sundown. According to the choice of Hebrew words in these verses, the beginning of the festivity relating to the

new moon is in the morning rather than at sundown. In these verses there is no reference to the standard Hebrew word for day, which is *yohm*, Strong's number 3117. The use of the Hebrew word for new moon in these verses is not referring to a 24-hour day, but instead it refers to the time of festivity.

These two verses show that it was considered important for David to be present at a banquet hosted by the king due to a "new moon", and there was a seat reserved for David. There is nothing in the context to suggest that this was the beginning of the seventh month and that a holy convocation was to take place. Indeed, if this had been the beginning of the seventh month, verses 5 and 18 would have more to say about why David would be missed! The reason given is the new moon, nothing more.

The Hebrew syntax in verses 27 and 34 is the same for one phrase that is not like any place in the Hebrew Scriptures where a numbered day of the month is mentioned. The Hebrew word order is "the *chodesh* the second", which occurs that way four times in the Hebrew Bible: I Sam 20:27, 34; I Ki 6:1; I Chr 27:4. In the latter two places it means "the second month". This expression "the *chodesh* the second" does not have the Hebrew word *yom* for "day", does not have a preposition attached to the beginning of the number, and has the number after the word *chodesh*. These three factors do not occur in any place where a numbered day of the month is mentioned in the Tanak. A Hebrew expression for a numbered day of the month occurs 98 times in the Bible. In 92 of these cases the Hebrew preposition *bh* (meaning "in" or "on") precedes the number. In two of these cases the Hebrew preposition *ad* (meaning "until") precedes the number. In 39 of these cases the Hebrew word *yom* (meaning "day") occurs at the number. While there are a total of four cases (Ezra 3:6; 10:17; Est 9:19, 21) in the Tanak where a numbered day of the month is mentioned and no preposition is prefixed to the number, all of these cases do have the Hebrew word *yom*, and none of these four cases have the number after the word *chodesh*. There is no example in Scripture with the syntax as in I Sam 20:27, 34 to indicate that it could mean a numbered day of the month.

The Hebrew word *chodesh* sometimes means "new-moon" and sometimes means "month", but because the syntax of this phrase in these two verses is never used for a day of the month, and because its meaning as "new moon" here gives a satisfying explanation to the context including the planned meeting of Jonathan and David on the third day from their initial meeting, *chodesh* will be translated "new-moon" below.

I Sam 20:27 literally states, “And it happened on the morrow of the new-moon the second, [the] place of David was empty. Then Saul said to Jonathan his son, Why didn't the son of Jesse come either yesterday or today to the meal?”

When the NASB is used, items in square brackets will show where the NASB has italics, indicating that no Hebrew word occurs for the italics. It may sometimes be useful to consider omitting the words in square brackets in the NASB because they are not based on words in the Hebrew text.

I Sam 20:27 [NASB], “And it came about the next day, the second [day of] the new moon that David's place was empty ...”

Thus there was something special about that meal on two successive days that made David's presence expected at both meals.

In verses 28 through 33 Saul and Jonathan dialogue with one another so that Jonathan becomes convinced that Saul wants to kill David.

I Sam 20:34 literally states, “And Jonathan arose from the table in fierce anger, and did not eat food on [the] day of the new-moon the second because he was grieved for David, for his father had dishonored him.”

I Sam 20:34 [NASB], “Then Jonathan arose from the table in fierce anger, and did not eat food on the second day of the new moon, for he was grieved over David because his father had dishonored him.”

I Sam 20:35 literally states, “And it happened in [the] morning that Jonathan went out [into] the field at [the] time appointed [with] David, and a little boy [was] with him.”

The morning in verse 35 is within the third day that David and Jonathan had planned to meet.

The special meal at the king's table on two successive days during which the presence of David, a national hero, was expected, shows that both meals were to commemorate the start of the month. The need existed to have two days of commemorative meals because they did not know in advance which of the two days would in fact begin the new month. From I Sam 20:27 we

can say that David and Jonathan did not know in advance which of two successive days would officially be declared the new moon day, because otherwise there would not have been a need for two successive days of a festive meal during which David was expected to appear. The phrase in I Sam 20:5, 18 that “tomorrow is a new-moon” is literally misleading because it can be expected to cause the reader to think that they knew in advance that tomorrow would in fact actually be the first day of the new month. It should be translated “tomorrow is the new moon [festivity]”.

I Sam 20:5, 18 was applied to the first day to come, and the designation of “new-moon the second” was given to the second day to come. The need to have a second day of commemoration indicates that on the first of the two days, the new moon was not officially declared by the Levitical priesthood to be the start of a new month by the blowing of two silver trumpets in accordance with Num 10:10.

The average length of a month is close to 29.5 days, and most of the time there is an alternation of 29 and 30-day months, although there certainly are exceptions. At the time that David and Jonathan first met, one would surmise that the previous month had 29 days, so that it was most likely that the current month that was nearly over would have 30 days. Thus, when David and Jonathan first met, they planned for the current month to be a 30-day month so that their next meeting would be on the third day rather than on the second day. They believed it was most likely that a second festive meal day would be needed due to an expected 30-day month. Therefore, when I Sam 20:5 and 18 speak of “tomorrow [is the] new-moon”, that refers to the festive national holiday (not holy day) on the first of two successive days during which the new month might begin. The author of I Samuel 20 expected the reader to understand that there was to be at least one, and possibly two, successive days of festive meals at the king's table at the start of each month.

The start of a month is used to determine festivals, so by Gen 1:14, the light of a heavenly body must determine the start of a month. The first light of the moon would not anciently be known until it was seen. I Sam 20 is evidence that the day of the new moon was not pre-calculated, because otherwise there would not have been a need to plan for two successive days of festive meals. A pre-calculation would have been calculated to precisely one day rather than a choice of two days.

I Sam 20:5 and 18 should be understood to mean “tomorrow [is the] new-moon [festivity]” rather than the officially declared new moon. In other words, David and Jonathan did not really know that “tomorrow” would actually be the first day of the new month. In fact they expected that “tomorrow” would not be the first day of the new month!

When reading Josephus, one must be on guard for any reason that Josephus might have for distortion in his account of an event. In his description of I Sam 20 it is difficult to see any reason why he might deliberately distort any technicalities of the story. This chapter should not have been a controversy among Jews in the time of Josephus. He was certainly living at a time when Hebrew was still spoken among the upper class in Jerusalem where he was reared in the first century. Josephus was born in the year 37, so he was 32 or 33 years old when the Temple was destroyed in 70.

Josephus corroborates the translation of *second new-moon* in his paraphrase of I Sam 20:27. On pages 283 and 285 of Josephus_5, Ant 6:236, we read, “But when, on the second day of the feast of the new moon, David again did not appear, he asked his son Jonathan why, both on the past day and on this, the son of Jesse had been absent from the festive meal.”

The Greek word that Josephus uses for “new moon” in the above translation is *noumeenia* (Strong's number 3561), not the Greek word *meen* (Strong's number 3376), which means “month”. Thus the NASB, taking the Hebrew syntax as it is, translates it so as to agree with Josephus who chose the Greek word for “new moon” rather than the Greek word for “month”. The William Whiston translation is very poor here because he translates it as though Josephus used the other Greek word (*meen*).

Page 861 of the chapter by Moshe David Herr translates I Sam 20:27 “But on the morrow of the second new moon ...”, and translates I Sam 20:34 “... and he ate no food the second new moon day”. According to pages 84-85 of the book by Cahn, the Karaite Benjamin Nahawendi c. 825 CE understood I Sam 20:27, 34 similarly. The German interlinear translation by Rita Steurer also translated these verses using the German translation equivalent to “second new moon” rather than “second day of the month”. The German word for new moon is different from the German word for month.

On page 36 of the book by Solomon Gandz he wrote, “There can be no doubt that ‘on the morrow of the second new moon’ [in verse 27] has the

same meaning as ‘on day of the second new moon’ [in verse 34] and that both phrases refer to the second day of the new moon festival, on which a festive meal was given at the King’s table and in which David was supposed to take part.” The very title of the chapter by Gandz is “The Origin of the Two New Moon Days”, and his analysis is consistent with the analysis given here, although his arrangement of the explanation is different and he does not use all of the logic presented here.

Within the above quote from Gandz, I have added the items in square brackets, and the two expressions enclosed within apostrophes have, in Gandz’ work, the Hebrew words rather than the literal translation that I have substituted. Gandz discusses this chapter and Jewish commentaries upon it during the past 1700 years.

Horace was a Roman poet and satirist who wrote in Latin and lived from 65 BCE to 8 BCE. On page 20 of the book by Horace, Satire 1.9.67-70 states: “Surely you wanted to tell me something, something confidential?” ‘Oh, yes, but I’ll choose a better time. Today is the thirtieth Sabbath. Why offend the circumcised Jews?’ ‘I don’t care about religion’, I moan”.

Here the expression “thirtieth Sabbath” is a literal translation of Horace’s Latin expression *tricesima Sabbata*. On page 375 of the book by Louis Feldman we find the following comment on this expression as found in the satire, “In summary, Horace’s allusion in *tricesima Sabbata* is more effective if it refers not to some meaningless nonsense but rather to the thirtieth, a Sabbath, that is, the New Moon, so prominently celebrated in Horace’s time.” Here it must be understood that the Jews desired to have a holiday (not holy day) on the new moon days. The Romans understood that the word Sabbath to a Jew meant a day on which he did not work at his ordinary job. It was easier for the Jews to tell the Romans that the new moon day that was the thirtieth of each month was always a Sabbath (called the thirtieth Sabbath) than to use other more accurate words from the biblical viewpoint. Biblically the new moon was not a Sabbath, but the Jews called it a Sabbath to simplify the implications of not working to the Romans.

The first of the two possible days of sighting the new crescent would place the first day of the month on the 30th day of the old month. Hence in Jewish practice of that time the 30th would be a holiday or a vacation day, and by loose extension (not technically correct), called a Sabbath. Since

Horace expected his readers to understand him, this new moon holiday, called the “thirtieth Sabbath” was well known in Rome in the late second century BCE.

It was common knowledge in the Roman Empire during Horace's adulthood that Jews refrained from work on the first of the two possible days on which the new month might begin. This harmonizes perfectly with the implications from the Hebrew in I Sam 20:27, 34 and the whole chapter. The paraphrase by Josephus also agrees with this.

If Israelite society at the time of King Saul, when the prophet Samuel was still alive, was using a calculation to determine the start of the next month, there would have been no point in having two successive days of festive meals associated with the new moon, which shows an uncertainty of which day among two successive days that would start the month. Thus no calculated calendar could have been used at this time of Israel's history. Ancient Israel did not employ predictive astronomy for their calendar.

[31] Applying I Sam 20 to II Kings 4:23 and Amos 8:5

In II Ki 4:8-11 we see that a woman in Shunem made a room available for Elisha to lodge at whenever he was in that neighborhood. According to maps that are commonly available in some Bibles, and according to Josh 19:18, which shows Shunem within the boundary for the tribe of Issachar, Shunem was about 10 miles to the southwest of the Sea of Galilee (named differently in Elisha's day). This is in the southern part of Galilee, about 60 miles north of Jerusalem, certainly not local to Jerusalem to be able to hear two silver trumpets blowing, and then soon going to witness a priestly ceremony for the beginning of the month. In II Ki 4:22 she asked her husband to prepare a donkey for her to ride upon to visit Elisha. In verse 23 her husband responded, “Why are you going to him today? It is neither the new-moon nor the Sabbath.” This shows that under normal circumstances this wealthy woman rode a donkey to visit Elisha on the new moon and on the Sabbath. However, in I Sam 20, the day for a new moon festivity was simply called the new moon, and it occurred immediately after the 29th day of the month. The same is true in the days of the Roman poet Horace before the first century. Based upon this, we should understand the question in I Ki 4:23 to mean, “It is neither the new-moon [festivity] nor the Sabbath.” This new moon festivity may be the first of two successive days of festivity.

Recognizing now, that the context with the Hebrew word *chodesh* for “new-moon” may mean “new moon [festival]”, the reader should not be surprised if this translation is proposed for appropriate contexts. The prophet Amos criticizes many people in the land who complain as follows in Amos 8:5, “When will the new-moon [festival] be past that we may sell grain and the Sabbath [be over] that we may trade wheat?” This indicates that there were restrictions by the national government against some activities on the new moon festival, but it does not indicate that there was some law within the law of Moses that prevented certain work on such days; there is no such law. There is no sin where there is no law. Nevertheless, Amos 8:5 along with II Ki 4:23 does indicate that the population beyond Jerusalem did involve themselves to some degree with the new moon festivity.

Since the new moon festivity had significance throughout Israel, it would especially have significance where the high priest, the ark, the Temple, and the ceremonial sacrifices took place. Although ceremonial details are not specified in Scripture, this implies that people near the Temple would witness the priestly ceremonies associated with the beginning of the month. However, there is no commandment in the law of Moses that ordinary work was forbidden or that attendance at this priestly ceremony was required for the beginning of the months.

[32] Rapid Communication to inform the Nation about the New Moon

Lev 23:24-25, “Speak to the children of Israel saying, ‘In the seventh month, on [the] first [day] of the month, you shall have a rest, a memorial of soundings, a holy convocation. You shall not do any servile work and you shall offer a fire offering to YHWH.’”

This first day of the seventh month was a festival day in which no ordinary work was done, and there was a commanded meeting with a festival service for this day. Deut 16:16 specifies the three times of the year when the adult male population was commanded to gather in one location within Israel, and the first day of the seventh month was not one of those three times.

Therefore, this festival at the beginning of the seventh month was kept at various local places throughout the nation. About half the months had 29 days and half the months had 30 days. These did not always alternate. The weather might be cloudy. Thus there would often be uncertainty whether the first of the two possible days for the new moon festivity would be the actual beginning of the seventh new month. With such uncertainty, the people

would have no choice but to avoid normal work and have a holy convocation on the 30th day. If that first day would not be declared the actual beginning of the seventh month, they would then celebrate two consecutive days for the first day of the seventh month. A method of rapid communication would be needed to inform the local gatherings around the country that the first day of the new moon festivity was declared to be the actual start of the seventh month, if this had happened. Once the priesthood declared the first day to be holy, the next day was not holy. Rapid communication would make it unnecessary to celebrate a second day as a holy day in the local areas after the priesthood declared the first day to be holy.

How would rapid communication throughout all Israel be possible in ancient times?

When the new crescent is seen, shortly afterward the moon falls below the horizon and then there is no moonlight at all and it is very dark all night. This makes it dangerous to travel at night, whether to go to the top of some local hills or to return after arriving. A lantern could make travel possible, but it would be slow and still dangerous in total darkness. Consequently, regardless of the method of primitive communication (certainly no telephones, Morse code, or radio), it would have to wait until daylight. During some circumstances of difficulty in sighting the new crescent near Jerusalem, the priesthood might even have to wait until some time during the middle of the following daytime to know whether to declare that first day as the true start of the new month.

Any big task is performed more quickly if multiple people are able to divide the task into smaller pieces, each one doing a small piece. For this to be effective in reducing the total time from start to finish, the time of their activity must overlap. Light travels much faster than people, horses, camels, or birds. Consider the following proposal. On the morning of the 30th day of the month certain people are appointed to travel to the top of designated hills throughout the country with materials that are able to start a controlled fire. The separated hills throughout the country would have to be close enough that they could see the fire from hills in the various directions. When the two silver trumpets were blown to announce the declaration of the start of the new month, the designated people who heard the trumpets would light their fires, and then this would rapidly spread throughout the country. The biggest time lag factor would be the time required to light the fire. It is even possible that a very small fire that could not be seen from far away was started first,

and then this fire that was already kindled could speedily be used to start a larger fire that could be seen from other hills. Such a system could enable all of Israel to know about the declaration of the new month within a few hours during the afternoon of the 30th day. While it is perhaps possible to imagine this happening at night, it does not seem very likely because of the possible danger when visibility is impossible without a fire. Another problem with suggestions that the procedure occur at night is the likelihood that some of the watchers might fall asleep at night while waiting to see a fire at another hill. During the daytime it would be more interesting to be looking because there would at least be visible scenery.

There is documentation of such a fire system for rapid communication in the *Mishnah*, which was published c. 200 by Judah the Nasi (Prince). Although appendix B shows reasons for rejecting the *Mishnah* as infallible for both doctrine and history, such a fire system for rapid communication does make common sense and it is difficult to imagine why there ought to be doctrinal bias associated with the general concept even if some of the details are embellished and not trustworthy.

On page 301 of the *Mishnah* at RH 2:3 we find (square brackets are by Jacob Neusner),

- “A. How did they kindle flares?
- B. They bring long cedar wood sticks, reeds, oleaster wood and flax tow.
- C. One binds them together with a rope.
- D. And he goes up to the top of a hill and lights them.
- E. Then he waves them to and fro and up and down, until he sees his fellow, doing the same on the next hilltop, and so on the third [and beyond].”

On the same page at RH 2:5 we find,

- “A. There is a large courtyard in Jerusalem, called Bet Yazeq, to which all the witnesses gather.
- B. And there the court examines them.
- C. Now they prepare big meals for them, so that they should make it a habit of coming.”

On page 302 at RH 2:6 we find,

- “A. How do they examine the witnesses?
- B. The pair which makes its appearance first do they examine first.
- C. They bring the elder of them and say to him, ‘Tell us, How did you see the moon? Was it facing the sun or turned away from it? Was it to the north

or to the south? How high was it, and in which direction was it leaning? And how broad was it?’

D. If he said, ‘It was facing the sun,’ he has said nothing at all.

E. Then they would bring in the second party and examine him.

F. If their testimony coincided, their testimony was confirmed.

G. And in the case of all the other pairs of witnesses, they ask the main points,

H. not because they need their [evidence], but so that they should not go out disappointed,

I. so that they would make it a habit of coming along in the future.”

[33] Summary about the New Moon Celebration and the Role of the Daytime

In summary, the 30th day of each month was a national holiday, not a commanded holy day, except for the seventh month. Two successive days may be celebrated for the beginning of the seventh month, and indeed for the beginning of every month. The priesthood had certain commanded duties to perform at the beginning of each month, but this was only commanded in one location where two priests blew two silver trumpets to summon the assembly, thus announcing the beginning of the new month and alerting the local people that the time had arrived for them to come and celebrate the proceedings associated with the new moon ceremonies. Some of the population in various parts of Israel was involved in feasting on the 30th day of each month. Based on the example of I Sam 20, such feasting would also occur on the next day if the new moon was not declared on the 30th day.

The following are some practical factors that are associated with the 30th day:

- (1) There was a need to enable the whole of Israel to know whether the 30th day began the new month.
- (2) There was a need to wait for possible witnesses to arrive at the site where the two silver trumpets were waiting with the priests, and this might not happen until sometime during the following daytime.
- (3) Rapid communication would require the daytime to enable the whole nation to be informed of the day that began the month.

The daytime of the 30th day was an important part of the celebration, and not merely for a festive meal. While it is certainly possible that witnesses could arrive during the night, only during the daytime was it possible for

significant numbers of local people to witness the ceremonies associated with the new moon, provided that the declaration was made. For that reason, even if witnesses arrived during the early part of the night, common sense would dictate that the priesthood would always want to begin the ceremonies at a time of the daytime when a maximum number of people could be present. Therefore, the daytime of the first day of each month was significant for the ceremonies and the people. The daytime was also significant for communication on the 30th day to the rest of Israel.

The sundown that began the 30th day was primarily significant in watching for the new crescent, not for the celebrations of that day if the new moon was declared.

[34] Today's Ambiguity in the Phrase *New Moon*

One source of possible confusion is the failure to realize that present day astronomers and almanacs define a new moon in a way that usually precedes the biblical new moon by one or two days. In order to avoid confusion, I will call the modern astronomer's new moon the ***astronomical new moon***, not the *new moon*. Another modern equivalent expression for the astronomical new moon is the ***conjunction of the moon with the sun***, or more briefly and simply, the ***conjunction***. At the time of the conjunction no one can see the new moon.

[35] Month Start Theories from Ps 81:3 and the double word *b-keseh*

Ps 81:3 contains the Hebrew word *chodesh* for new-moon. The grammatical structure of this verse along with the controversial Hebrew double word *b-keseh* has triggered some unusual theories concerning the biblical day of the new moon, i. e., the first day of the biblical month. Keep in mind that this is a poem so that it is often translated with capitalization that reflects different lines in poetry, and this accounts for the translation from the NASB below. This verse contains the double word *b-keseh*, which is the Hebrew preposition *bh* prefixed to the Hebrew word *keseh*. This preposition most typically means "in", "at", or "on". The controversy does not involve the meaning of this preposition, but instead, the meaning of *keseh* along with its attachment to this preposition.

(A) Three Translations of Ps 81:3

Compare the following three translations of Ps 81:3. In the Hebrew text this is numbered verse 4.

Ps 81:3 [KJV], “Blow up the trumpet in the new moon, in the time appointed, on our solemn feast day.”

Ps 81:3 [NASB], “Blow the trumpet at the new moon, At the full moon, on our feast day.”

Ps 81:3 [RH 8a-8b on page 30 of BT-BEZ-RH], “Blow the horn at the new moon, at the covered time [*keseh*] for our feastday.”

The above quotation from a translation of the *Babylonian Talmud* has the square brackets with English transliteration copied from the original source unchanged in spelling, even keeping “feastday” as one word. In fact the ending “our feast day” is all one word in Hebrew, and this word has the grammatical ending that shows “our”. All Scripture translations in this version of the *Babylonian Talmud* are actually in italics, but I quoted it without italics (yet with italics for the transliteration *keseh*) to achieve uniformity in printed style for all three translations. This is one of the three places where the *Babylonian Talmud* contains this verse. The other two places are in Bezah 16a on page 80 of BT-BEZ-RH and in San 11b on page 51 of BT-SAN. The context under discussion within all of these places from the *Babylonian Talmud* shows that it means “covered time” because it claims that this verse is entirely about the first day of the seventh month, which it calls the New Year [festival], Rosh Ha-Shanah.

Since the *Babylonian Talmud* is a commentary on the *Mishnah* and includes the words of the *Mishnah*, it would have to be consistent with the intent of the *Mishnah*. The *Mishnah* strongly and unambiguously supports the belief that the sighting of the new crescent with subsequent approval by appropriate Jewish authority establishes the start of the month, although no month is permitted to exceed 30 days. Consequently, this translation is *not* intended to imply to its readers that its phrase “the covered time” refers to total invisibility of the moon for the whole period of late afternoon through the night. On the contrary, the new crescent may be visible for about an hour before it sinks below the horizon, but this does not violate the intent of the phrase “the covered time”. The vast majority of the night the moon is covered in the sense that no observer on earth can see any directly reflected light that originates from the sun but comes from the moon.

These three translations are very different for the Hebrew word *keseh*, where the KJV gives “time appointed”, the NASB gives “full moon”, and the *Babylonian Talmud* gives “covered time”. The original intent of the Hebrew can only mean one of these choices.

If the NASB translation of “full moon” is accepted as correct, it implies that the feast day at the end of this verse must either be the first day of Unleavened Bread or the first day of the Feast of Tabernacles, both of which occur on the 15th day of the month. Commentaries argue for both festival choices.

(B) Three Theories from Ps 81:3

In my personal discussions about the biblical calendar with various people over the years, based on the different choices of meaning for the word *keseh* in the context of Ps 81:3, I have encountered the following different theories:

Theory A (Full is Fifteenth): This theory claims that the biblical new moon, Hebrew *chodesh*, occurs on the day so that after consecutive days of counting, makes the astronomical full moon always fall on the 15th day of the biblical month. Therefore, by counting backwards from the computed time of the full moon, the first day of the biblical month may be determined. This theory assumes that the sighting of the new crescent from Israel will almost always agree with this method, and this is done for simplicity. This theory utilizes a translation like the NASB.

Theory B (Full is New): This theory claims that the day of the biblical new moon, Hebrew *chodesh*, begins at the sunset that the full moon is detected, not about a half month earlier. Therefore, the first day of the biblical month begins with the detection of the full moon (not with a computation). This theory utilizes a translation like the NASB.

Theory C (New is Conjunction): This theory claims that the biblical new moon, Hebrew *chodesh*, is technically the time of the astronomical new moon (conjunction), not about one or two days later. The biblical day that begins on or after the conjunction is considered the first day of the biblical month. This theory utilizes a translation like the *Babylonian Talmud*, but its meaning of “covered” is taken to mean that the moon is not seen at all from late afternoon and all through the night.

(C) Discussion of Theory A (Full is Fifteenth)

This theory is based upon the correctness of the translation of the NASB above (this would imply that *keseh* means “full moon”). It recognizes that the new moon occurs about half a month before the full moon. In order for this theory to have validity, it would require that the biblical concept of the “full moon” be defined so that only one day may be considered the full moon. Secondly, it would require that astronomical computations demonstrate that the day of the full moon based upon the sighting of the new crescent from Israel would almost always fall on the 15th day of the month. It will now be explained that both of these requirements are false.

The astronomical full moon was defined in the above chapter titled “Astronomical New Moon (Conjunction) and Full Moon”. In the chapter after that one titled “Variation from Astronomical New Moon to Full Moon; Variation from New Crescent to Full Moon” it was explained that the time from the astronomical new moon to the astronomical full moon varies so that the difference between the minimum time and the maximum time is about 2.07 days. The same chapter also explained that typically the moment of the astronomical full moon occurs on the 13th, 14th, or 15th days of a month that begins with the new crescent. This astronomical reality implies that the biblical concept of the full moon in Ps 81:3 (based upon the above translation from the NASB) would have to describe “general roundness” rather than an exact moment of the astronomical full moon. In the above chapter titled “Ancient Meaning of the Full Moon” it was explained that the Jewish philosopher Philo of Alexandria considers both the 14th and the 15th days of the month to be days of the full moon. Hence he does not consider the full moon to be an instant in time or only one day of the month. Thus Philo agrees with the astronomical reality that the 15th day of the biblical month does not have to be the day of the most round moon.

The above Preface explained that Rob Anderson wrote a computer program that accurately predicts the sighting of the new crescent from Jerusalem except for borderline cases. Such cases occur about seven percent of the time, although cloudy and rainy conditions are exempted from this percentage. Appendix F was made possible through the efforts of Rob Anderson. In 1982 he wrote an additional program based on the first one that determined the biblical day in which the moment of the astronomical full moon occurred. Using the 100 years from 1900 through 1999 and using the

first and seventh months in those years as determined by the MCJC (Modern Calculated Jewish Calendar), he thereby selected 200 full moons. His computer program determined the days of the theoretical biblical month on which the full moon occurred. Here are the results for the 200 months.

Theoretical biblical day 12 of the month:	1 full moon.
Theoretical biblical day 13 of the month:	44 full moons.
Theoretical biblical day 14 of the month:	94 full moons.
Theoretical biblical day 15 of the month:	60 full moons.
Theoretical biblical day 16 of the month:	1 full moon.

Based upon the method that theory A uses to determine the day of the full moon, the number of the day is shifted by one in comparison to the above data. This means that according to theory A, the 15th day of the biblical month should produce 94 full moon days out of 200 for the combined first and seventh months (in the MCJC's first and seventh months). Thus about 47 percent of the time (half of 94) theory A would be correct for the first day of the month.

Since both requirements for this theory to be true have been shown false, we conclude that theory A is false.

(D) Discussion of Theory B (Full is New)

This theory is based upon the correctness of the translation of the NASB above (this would imply that *keseh* means “full moon”). In a prior chapter titled “Full Moon occurs about the 14th and 15th Days of the Biblical Month”, the evidence for the veracity of this chapter title was shown from the Hebrew and Ugaritic cognate words along with Ugaritic writings. In order for theory B to be true, the full moon would have to occur on the first day of the month.

In a prior chapter titled, “Isaiah 47:13, Astrologers, the Zodiac, and the meaning of *chodesh*”, it was shown from the context along with evidence from ancient Babylon that the officially sanctioned new crescent began the start of a new month in ancient Israel.

In a prior chapter titled, “The Biblical New Moon relates to the Sighting of the New Crescent” it was shown from a combination of Scriptures including

Ezra 6:15 and Neh 6:15 (without the use of Isa 47:13) that the officially sanctioned new crescent began the start of a new month in ancient Israel.

In the prior chapter titled, “Philo of Alexandria and the Jewish New Moon in the First Century” it was shown that Philo claimed that the new month began at the time of the sighting of the new crescent. He did not go into details concerning the role of the priesthood.

Thus, four sources of independent consistent evidence show that the full moon cannot begin the biblical month. Beyond this, consider the following. After Ezra and Nehemiah returned to Jerusalem from the Babylonian captivity, Neh 8:2, 9 states that the day they called the first day of the seventh month was holy. As long as the reader accepts this to be true, it would mean that the biblical method to determine the first day of the month was still being used shortly after the Babylonian captivity. Hence their method to determine the first month did not get corrupted in Babylon during the captivity. With one hereditary priesthood from that time forward into the first century, it is difficult to imagine that the concept of what determined the first day of the month could change so radically that the start of the month could get shifted by about half a month, according to theory B. As previously documented, Philo of Alexandria wrote that the 14th and 15th days of the Jewish month showed the full moon.

Nevertheless, it is important to address the issue that underlies this theory. A literal translation of Ps 81:3 that preserves the Hebrew word order and uses the translation “full-moon” for *keseh* is: “Blow in [the] new-moon the ram's horn, [and] in [the] full-moon on [the] day of our feast.” Without adding the word “and”, it does give the impression that the full moon defines the new moon. This verse has two prepositional phrases: “in [the] new-moon” and “in [the] full moon” using the same preposition to begin each phrase.

Next, three verses from the Psalms will be presented that have a sentence structure similar to Ps 81:3 to show that the reader need not insist that the full moon defines the new moon based upon the grammar of this verse. Hence it is permissible to add the word “and” to the translation in order to give the correct sense to the reader. In poetry, normally expected words may need to be supplied in translation. The sentence structure of Ps 81:3 has the following three characteristics:

(1) The Hebrew word for “and” does not exist in the verse.

(2) The Hebrew has two or more prepositional phrases with the same preposition.

(3) Only one verb occurs, and this precedes the prepositional phrases.

These characteristics apply to the following three verses, all translated according to YLT because it preserves the Hebrew sufficiently to note the grammar.

Ps 13:2. “Till when do I set counsels in my soul? Sorrow in my heart daily?” Here “soul” and “heart” are not identical. The phrases are not near synonyms.

Ps 50:9, “I take not from thy house a bullock, From thy folds he goats.” Here “thy house” and “thy folds” are not identical. The phrases are not near synonyms.

Ps 116:8, “For Thou hast delivered my soul from death, My eyes from tears, my feet from overthrowing.” Here “death”, “tears”, and “overflowing” are not identical. The phrases are not near synonyms.

These poetic examples show that the two prepositional phrases in Ps 81:3 need not be near synonyms on the basis of the grammar. Hence this theory is merely a guess on the basis of grammar, and is defeated by the several reasons given above.

(E) Discussion of Theory C (New is Conjunction)

This theory is based upon the correctness of the translation of the *Babylonian Talmud* above (this would imply that *keseh* means “covered time”). According to this claim, the biblical day that begins on or after the conjunction is considered the first day of the biblical month.

The conjunction occurs at a time when the moon does not give any light to the earth except during the rare case of a solar eclipse. However, in a chapter titled, “Appointed-times and Years are known from Lights in the Sky”, it was explained that Gen 1:14-15 requires that the appointed times be determined by the lights in the sky. This requirement of a sign based on some specific light is contrary to the use of the conjunction, which is not known by some sign of light. Gen 1:14-15 refutes the use of the conjunction to determine the beginning of a biblical month.

In a prior chapter titled, “Astronomical New Moon (Conjunction) and Full Moon”, astronomical evidence was presented to show that from the time between the old crescent and the new crescent there are from one to three nights during which the moon cannot be seen under clear weather conditions. People did not know this number of nights of invisibility in advance except that each month had 29 or 30 days. In practice, this means that the approximate time of the conjunction could not have been known without a computation.

This theory requires that at the time of Moses the Israelites had the ability to calculate the time of the conjunction. In a prior chapter titled, “When in History did Prediction of the Astronomical New Moon Begin?”, it was shown that the Babylonians were able to predict possible solar eclipses about 360 BCE with a time error of about three hours. This ancient Babylonian knowledge was written in the cuneiform language which only survived among the Babylonian pagan priests, and thus was a secret. But when Alexander the Great conquered Babylon about 30 years later, the mathematical astronomical results became available to the Greek astronomers. A solar eclipse must occur at the time of the conjunction. Although history does not indicate that the ancient Babylonian astronomer-astrologers at this time had any interest in conjunctions that were not solar eclipses, at least this indicates that from c. 360 BCE, if these Babylonians wanted to do so, they could approximate conjunctions to an average of about three hours. History shows this to be the first time that any ancient society had this ability. It was achieved after having developed generalized methods of performing long division with fractions utilizing the base 60 number system. It also required the development of certain areas of algebra. In a prior chapter titled, “Did Ancient Israel Excel in Advanced Mathematical Astronomy?”, it was shown that ancient Israel did *not* use a positional digit system with a zero, so that they would not have achieved the mathematical astronomy of the Babylonians. Hence this theory contradicts the history of mathematical astronomy concerning the conjunction.

In a prior chapter titled, “Isaiah 47:13, Astrologers, the Zodiac, and the meaning of *chodesh*”, it was shown from the context along with evidence from ancient Babylon that the officially sanctioned new crescent began the start of a new month in ancient Israel. This is contrary to the use of the conjunction.

In a prior chapter titled, “The Biblical New Moon relates to the Sighting of the New Crescent”, it was shown from a combination of Scriptures including Ezra 6:15 and Neh 6:15 (without the use of Isa 47:13) that the officially sanctioned new crescent began the start of a new month in ancient Israel. This is contrary to the use of the conjunction.

In a prior chapter titled, “The Beginning of the Month and I Samuel 20”, it was shown that the ancient Israelites at the time of the prophet Samuel did not know in advance which of two successive days would be the first day of the coming month. Thus the Tanak proves that no computation was used to determine the first month. Thus the conjunction was not used to determine the start of a month,

In a prior chapter titled, “Philo of Alexandria and the Jewish New Moon in the First Century”, Philo was quoted to show that the Jewish month began with the sighting of the crescent after the conjunction. The determining factor was the sighting of the crescent. This historical evidence shows that the conjunction was not used to determine the start of a Jewish month in the first century.

Two further aspects of Ps 81:3 remain to be discussed. The first aspect is whether the Hebrew word *keseh* in Ps 81:3 can be the Hebrew verb *kasah*, which is Strong's number 3680. This verb means “to cover” or “to hide”. These words, *keseh* in Ps 81:3 and one form of the verb *kasah* sometimes look the same if the vowels are discarded, and the vowels were not originally in the Tanak. Some people with whom I have spoken claim that *keseh* should indeed be Strong's number 3680. The second aspect is the question of the original meaning of *keseh* in Ps 81:3. The first aspect is considered now, and the second aspect is discussed in the next chapter.

(F) Can *keseh* in Ps 81:3 be the verb *kasah* (3680)?

The translation of Ps 81:3 from the *Babylonian Talmud* rendered the Hebrew expression *b-keseh* as “at the covered time”. The prefixed preposition *bh* was translated “at”. The definite article “the” is not required in Hebrew, yet it is implied. The word pair “covered time” is the translation of *keseh*. This word pair is a noun, so that the *Babylonian Talmud* did not treat this as the verb *kasah* (3680). Reference works assign Strong's number 3677 to *keseh*. This is always translated as a noun, not a verb.

The verb *kasah* (3680) occurs 152 times in the Tanak. It is found on pages 491-492 of BDB and on pages 607-608 of Wigram. Among the 152 occurrences, the word *keseh* in Ps 81:3 looks like the Hebrew verb *kasah* in 15 places in the Tanak (Ex 10:5; Lev 16:13; Num 9:15; 22:5; Job 15:27; 23:17; 36:30, 32; 78:53; Prov 12:16, 23; Isa 29:10; Ezek 18:16; Hab 3:3; Mal 2:16). None of these 15 places have a prepositional prefix such as *bh* found in *b-keseh*, and in fact there is a grammatical reason why there could not be such a preposition prefixed to this form of the verb *kasah* identified as Strong's number 3680. I have examined the Hebrew word *kasah* in all 152 of its occurrences in AKOT, and the grammatical form of the verb is always stated there.

Note 2 on page 85 of the biblical Hebrew grammar book by William Harper states, "Only to the Infinitive Construct may prepositions be prefixed or suffixes added." This is saying that the "infinitive construct" form of a verb may have a prepositional prefix, but no other verb form may have a prepositional prefix. Having looked up and given specific attention to all of these 15 places in AKOT, I can say that none of them are called the infinitive construct. Furthermore, there are 14 places among the 152 where the verb form is indeed identified as the infinitive construct (Ex 28:42; Num 4:15; I Ki 7:18, 41, 42; II Chr 4:12, 13; Ps 104:9; Ezek 24:7, 8; 38:9, 16; Hos 2:9; Mal 2:13). All except two of these 14 places do have a prepositional prefix. All of these 14 places have the same pronunciation and Hebrew consonants, and this is different from *keseh*. The transliteration is *ksoht*. Therefore, the double word form *b-keseh* has a grammatical limitation (infinitive construct) if *keseh* is to be a verb, and the verb *kasah* does not conform to this limitation. Thus *keseh* in Ps 81:3 is not Strong's number 3680 and *keseh* is a noun, not a verb. Hence evidence from the Hebrew text of the Tanak shows that *keseh* does not mean the verb "to cover", Strong's number 3680.

To be thorough and satisfy my curiosity, I also looked up the name of the verb form of all 152 occurrences of *kasah* in PARSE_1 and PARSE_2 to see whether the use of the infinitive construct would be corroborated. It was. Pages 88-91 of BDB discusses the preposition *bh* in its various uses. Beginning at the bottom of page 90 under category V, it states, "Followed by an inf. c." This is an abbreviation for "infinitive construct", and hence this category of meaning includes a verb that follows *bh*. Some other meanings of *bh* relate to the opposite order when a verb comes first and *bh* comes second (beyond the verb and not attached to the verb). Only category

V pertains to *bh* and a verb following it. Thus BDB corroborates the grammar book by Harper. Thus *keseh* in Ps 81:3 cannot be the verb *kasah* (3680).

[36] The Noun *keseh* in Ps 81:3 means the Approximate Full Moon

The noun *keseh* in Ps 81:3 has a context that is both astronomical (because in the Hebrew text it is not far from *chodesh*, meaning “new-moon”) and related to a feast day (because it occurs close to the Hebrew word *chag*, which is Strong's number 2282, meaning “festival”). With the vowel points stripped away from *keseh* as they were originally, this word looks like the Hebrew noun *keesay*, which is assigned Strong's number 3678 and is most often translated “throne” well over 100 times. Since “throne” does not fit the context of Ps 81:3, this meaning is rarely attempted there. In Ps 81:3 the Masoretes (c. 650) have added vowels to *keseh* different from those in *keesay* because they believed it represented a different word with a different meaning due its different context.

Looking under the English word “moon” on page 819 in NASB-CONC, we note that in three places (Job 26:9; Ps 81:3; Prov 7:20) the NASB has the translation “full moon” for *keseh*, to which it assigns Strong's number 3677. Among these three places that show a context of astronomy (or time that relates to astronomy), there is no clear context that definitely shows its meaning to be “full moon”. In Job 26:9 the majority of translations favor the figurative meaning “throne” instead of “full moon”.

Without a clear biblical context to provide a meaning for *keseh*, the evidence from historically early sources must be given the most weight, and this includes cognate words from ancient Semitic languages. The Dead Sea Scrolls do not show any translations of *keseh* with an astronomical context. The vagueness of the Septuagint in both Ps 81:3 and Prov 7:20 shows that its translators were guessing about the meaning of *keseh*. When Jerome first translated the Psalms from the Septuagint into Latin c. 383 and again c. 387 (page 11 of Charles Callan 1949), he used the same vagueness as the Septuagint in Ps 81:3. Later, c. 392 (page 233 of Charles Cooper 1950), Jerome translated the Psalms from Hebrew to Latin, and this will be discussed below in the chronological flow.

The Aramaic Targums (Jewish paraphrases of the Hebrew Tanak into Aramaic) are not distinctly dated and were likely written c. 200-500, which

is too uncertain to make any useful claims. An Aramaic Targum (page 89 of E. Nestle 1879) gives the paraphrase of the second prepositional phrase that I translate “in [the] covered new moon”. In the Rabbinic writing *Leviticus Rabbah* 29:6, on page 373 of the translation edited by H. Freedman and Maurice Simon 1977, we find, “when it is concealed”. Unfortunately the date of the composition of *Leviticus Rabbah* is not known, but it probably comes from at least the early middle ages. The three examples for Ps 81:3 shown above from the *Babylonian Talmud* date from c. 500-600, and this is quite late. The problem with accepting meanings from the *Babylonian Talmud* and other Rabbinic writings is that its reasoning for the meaning of any biblical text does not involve Hebrew grammar, cognate languages, secular contexts with the key Hebrew word in focus, or older translation sources. These latter techniques are general scholarly methods toward arriving at a meaning. The *Babylonian Talmud* claims authority to itself through its own learned and highly respected sages, but we have no ancient texts that corroborate the alleged views of these sages, except what may previously occur in the *Mishnah* from c. 200. With the destruction of the Temple in 70 along with the abandonment of the priesthood, there was opportunity for a discontinuity in biblical understanding. There are some known clashes in understanding between the Sadducees and the Pharisees. At c. 200 Hebrew ceased being a common language, so that infrequently used Hebrew words in the Tanak became susceptible of losing their original meaning.

The earliest known sources that relate to *keseh* are from ancient Semitic languages that involve three texts, one in Ugaritic, one in Akkadian, and one in Phoenician.

The Ugaritic text that relates to *keseh* is labeled RS 24.271 and dates to the period of the Judges in Israel. It is transliterated on page 584 of Virolleaud 1968. On each line of the text there appears one pair of names of deities with the word that means “and” separating the names. Line 6 is shown as “*yrh w ksa*“, omitting almost all vowels as is common to writing in ancient Hebrew, Ugaritic, and Phoenician. The word *yrh* (the “h” has an extra mark to indicate the sound of approximately “k”) is an obvious cognate to the Hebrew *yerach*, meaning “moon”, and this is not controversial among Ugaritic scholars. We note that line 4 has “*dgn w bl*“, which obviously means “Dagon and Baal” (mentioned on page 98 of John Gray 1978). During the period of the Judges, Dagon is mentioned in I Sam 5:2-7 and Baal is mentioned in Judg 6:25-32. There is not a lot of contextual clarity for

ksa, yet it is associated with the moon here. This shows a simultaneous written and astronomical context that indicates a good cognate to Ps 81:3. The names of deities are nouns and represent nouns. This would be some distinctive appearance of the moon, with prime candidates being either the new crescent or the full moon. It does not make good sense to think this means “covering” as in the absence of all light when the moon is covered from view. No ancient society is known to consider the absence of light from the moon as a deity. Taken as it is without any prejudice from other contexts, it would most naturally mean the new crescent or the full moon.

The single Akkadian context that relates to *keseh* is less clearly dated. Akkadian was phased out as a commonly spoken language by Aramaic about 900 BCE. It was spoken in Assyria and Babylon. The Hebrew word *keseh* is discussed on page 487 of HALOT where it gives the reference from Zimmern 1910, but the reference from page 63 of Zimmern 1917 is also relevant. The conclusion from page 487 of HALOT is that the Akkadian word *kuseu* means “headdress” of the moon god at the time of the full moon. Here the association of the time of the full moon is relevant, but the word itself means “headdress”, which is round. The contextual closeness of this association to *keseh* is somewhat subjective because a headdress by itself is not astronomical, yet there is a link through the time of the full moon.

The Phoenician text that relates to *keseh* has two methods to designate this text, one is “Larnaka 2:12” and the other is “KAI 43:12”. This writing was discovered in 1893 on the Mediterranean island of Cyprus where the ancient Phoenicians had established a colony. From the facts in the text, page 245 in Van den Branden dates this writing to 272 BCE. This whole context is printed in the equivalent modern Hebrew characters on page 57 and translated on page 58 in Honeyman 1940. The word *chodesh* occurs several times where it is translated month. The right edge of the writing is partly crumbled off so that the start of line 12 is missing. With added vowel sounds including the added three consonants that scholars believe were originally present in brackets, the key phrase is “[*b-chode*]shim v *b-kesehim*”. The plural noun ending *im* is there twice. Honeyman's translation of this phrase on page 58 is “on [the] new moons and on [the] full moons”, referring to times of animal sacrifice. The whole text is prose rather than poetry, and there are no examples of repetitions of phrases that mean the same thing in approximate synonyms. With the presence of the word for “and”, this indicates that *chodesh* does not mean *keseh*, and both refer to distinctive times of the lunar cycle for animal sacrifice. Phoenician contexts show that

chodesh means either “month” or “new moon”. Thus the implied natural choice for *keseh* here is “full moon”. This is good evidence that the Phoenician word *keseh* is cognate to the Hebrew word *keseh*, and the meaning is “full moon”. The nature of the context is a very good match because both Ps 81:3 and Larnaka 2:12 have *chodesh* and *keseh*.

Aquila translated the Tanak into Greek c. 130 (note page 36 of Louis Ginzberg 1902), and this was quite literal in a word for word sense. This was about 60 years after the Temple was destroyed when Hebrew was still spoken in limited areas of greater Palestine. Aquila's early life was in a solely Greek speaking environment, but he later moved to Palestine where he studied Hebrew. In his translation from Hebrew, he was aided by leading Jewish scholars of his time (note F. C. Burkitt and Louis Ginzberg 1902). Only small portions of Aquila's translation have survived. On page 182 of Reider and Turner the Greek word *panseleenos* is given as Aquila's translation of *keseh* in Ps 81:3 and Prov 7:20. This Greek word appears on page 1299 of Liddell and Scott where the meaning is “full moon” or “time of full moon”. This Greek word also appears on page 1053 of Hatch and Redpath where Aquila's version is cited as the source in these two places. The full Greek text of Aquila's version of Ps 81:3 appears on page 232 of F. Field where the symbol for the translation by Aquila as well as the symbol for the later translation by Symmachus (c. 180) appear, showing that both translations agree. Aquila's Greek phrase including *panseleenos* is shown in Prov 7:20 on page 324 of F. Field. In summary, Aquila's translation from c. 130 made with the help of the leading Rabbinic scholars when Hebrew had not yet become a dead language shows that *keseh* means “full moon”.

The Syriac language is an offshoot of first century Aramaic, and is thus a Semitic language with significant affinity to Hebrew. The Syriac translation from the Tanak was made c. 150-200 according to estimates made by Michael Weitzman 1998, page 258. The Peshitta text of Ps 81:3 written in Syriac script (listed as verse 4 in both the Hebrew text as well as the Syriac text) appears on page 126 of William E Barnes 1904. On the second line of verse 4 the word at the right that is written in Syriac script is transliterated *vbks* (hence “and in [the] *kesa*”) if one examines the chart of English, Hebrew, and Syriac letter equivalents given on page 10 of William Jennings 1926. (I made this transliteration based on this chart because I do not know Syriac script.) Thus the translators from the Hebrew into the Syriac from c. 150-200 used the Syriac word *kesa* for the Hebrew *keseh*. The same Syriac script for *kesa* in Ps 81:3 found on page 126 of William E Barnes (noted

above) also appears on page 220 of the Syriac dictionary by J. Payne Smith 1903. There Smith gives the meaning of the Syriac word “time of full moon, the fifteenth day of the month”.

When Wilhelm Gesenius (1786-1842) expanded his commentary on selected Hebrew words after his acclaimed Hebrew lexicon was published, he named his expansion *Thesaurus*. He wrote this in Latin, and his second edition was published in 1835. On pages 698-699 of this work we find Gesenius' expanded discussion on *keseh*. My expanded translation from Gesenius' Latin text (yet omitting some Syriac script with its citations) concerning the Syriac word *kesa* is the following: “Isa Bar Ali, who wrote a Syriac lexicon before 900 CE, shows the Syriac word *ksh* to mean 'full moon' based upon clear contexts, e. g., 'the full moon on the night of the fourteenth'. In the Syriac Peshitta, the Syriac word *kesa* is used in I Ki 12:32 to refer to the fifteenth day of the month and in II Chr 7:10 to refer to the twenty-third day of the month, indicating that a variation from the middle of the month onward for eight days qualifies for *kesa* in Syriac. Barhebraeus and Ephraim Syrus also use the Syriac *kesa* to refer to the whole time of the full moon. In *Acta Martyrum* (a Syriac version of *Acts of the Martyrs*, c. 250 CE), 1:175, *kesa* is used opposite the new moon.” Gesenius also mentions that Aquila's translation into Greek and Jerome's translation into Latin, both from the Hebrew, also gives the meaning of *keseh* to be “full moon”. He concludes that *keseh* in Ps 81:3 and Prov 7:20 means (approximate) “full moon”. The Ugaritic, Akkadian, and Phoenician texts were not discovered until after Gesenius died. In summary, the Syriac translation of Ps 81:3 made c. 150-200 CE shows that its cognate Semitic word *kesa* for the Hebrew *keseh* means “(approximate) full moon”.

Jerome translated the Psalms from Hebrew into Latin c. 392 (page 233 of Charles Cooper 1950). Page 103 of J. M. Harden 1922 shows that his Latin translation of the Hebrew prepositional phrase *b-keseh* was *in medio mense*, which means “in the middle of the month”, and of course this is the general time of the full moon. Jerome did have some access to Aquila's translation of the Tanak into Greek (page 36 of F. C. Burkitt 1902), so that Jerome's translation of Ps 81:3 could have been partially influenced by Aquila. However, Jerome's primary goal was to produce his own translation based upon the knowledge of Hebrew that was imparted to him by various Jewish scholars. Jerome's judgment was against the belief that *keseh* means “at the covered time”.

The decisive evidence in favor of the meaning of *keseh* as “the time of the approximate full moon” is from: (1) the Phoenician cognate word in the text Larnaka 2:12 in 272 BCE; (2) Aquila's translation c. 130; (3) the Syriac cognate word in the Syriac Peshitta's translation c. 150-200; and (4) Jerome's translation c. 392. The Rabbinic writings including the *Babylonian Talmud* represent a tradition of unknown origin that cannot overcome the multiple early heavy evidences, especially considering that Aquila and Jerome learned Hebrew from Jewish scholars.

The end of Ps 81:3 mentions a feast day that occurs at the *keseh* (full moon), so that this feast day must fall on the 15th day of the month, because the first day of the seven days of Unleavened Bread and the first day of the Feast of Tabernacles are festival days that occur on the 15th day of the month. (These two festival days are the only candidates for this context.) Since the previous chapter discussed the fact that the 15th day of the biblical month is not always the day that contains the time of the exact full moon, the word *keseh* must refer to the “approximate” full moon, not the precise full moon. This thinking is based upon the science of astronomy. Beyond this, it has been explained above that the cognate Syriac word *kesa* means the “approximate full moon”, not the exact full moon. Near the beginning of this book it was also shown that Philo of Alexandria considered both the 14th and the 15th days of the month to be days of full moon, showing that as a first century Jew, he did not think that the full moon was confined to one specific day of the month. Hence there are three reasons for the understanding that *keseh* is the *approximate* full moon rather than the exact full moon: (1) astronomy; (2) the Syriac cognate word; and (3) the testimony of Philo.

There is a clear explanation for the KJV's translation of the Hebrew prepositional phrase *b-keseh* as “in the time appointed”. Within Orthodox Judaism the most respected Jewish commentator on the Tanak as well as the Talmud is Rashi (1040-1105). His commentary on Ps 81:3 is found on page 383 of Gruber 1998 where Gruber translates, “AT THE *kesse*, the day appointed, prepared and fixed for it. In the same vein 'He will come home at the *kesse*' (Prov. 7:20) [i. e.], at the appointed time which has been fixed.” In the previous quote the part in parentheses and square brackets are from Gruber. The concept of “preparing and fixing an appointed time” means “to determine and specify beforehand an appointed time”. Thus Rashi's interpretation differs from the plain meaning of the *Babylonian Talmud*. Tanach-Stone translates the phrase in Ps 81:3[4] as “at the time appointed”, thus following Rashi rather than the plain meaning of the *Babylonian*

Talmud. Since Tanach-Stone is a translation by a team of Orthodox Rabbis, it shows that sometimes Orthodox Rabbis will side with Rashi rather than the Talmud. Gruber points out in footnote 9 on page 385 that Rashi gives credit for his interpretation to another source.

Pages 394-395 of Franz Delitzsch 1952 explains the reasoning behind Rashi's interpretation, along with other Jewish scholars who later agreed with him, where Delitzsch wrote, "... a time fixed by computation (from [Hebrew] *kasah* = [Hebrew] *kasas*, [Latin] *computare*)". I added the square brackets for clarity. The Hebrew word *kasas* is explained here by the Latin word *computare*, which means "to compute". When you compute an appointed time, you determine and specify beforehand an appointed time through a computation. This excessively brief explanation by Delitzsch is saying that Rashi favored the view that the Hebrew word now in the Tanak was originally the Hebrew word *kasas*. Thus Rashi is asserting that the last letter in this word got copied incorrectly and all subsequent surviving copies duplicated this error. Rashi favors the meaning of the different Hebrew word *kasas* that he supposes was the original word. Rashi used this technique of textual criticism frequently in his corrections to the Talmud. During the time of Rashi, Orthodox Jews were opposed by the Karaites in the determination of the calendar. The Orthodox scholar Rashi favored the modern calculated calendar, and he chose an explanation of Ps 81:3 that implied a computation to fix the day. My speculation is that Rashi was motivated to favor an explanation that supported a calculated calendar.

Some Orthodox Jewish translations follow the Talmud instead of Rashi. For example, Rabbi S. R. Hirsch translates the key brief Hebrew phrase into the expanded "on the day of the veiling of the moon" (see page 85 of S. R. Hirsch 1966). Few people would imagine that the KJV in Ps 81:3 would favor a translation that was based upon Rashi's textual criticism of the Hebrew text.

[37] Biblical View of the Sun's Yearly Motion is South - North

Ecclesiastes mentions the sun (*shemesh* in Hebrew) more than any other book of the Bible - 35 times! One pair of verses gets specific about its motion, but this is only noticed if care is taken to preserve the Hebrew word order and if courage is exercised to allow the Hebrew to make sense! A literal translation of Eccl 1:5-6 with special attention to keeping the word order the same as it is in the Hebrew text is:

Eccl 1:5, "And rises the sun and goes [away] the sun and to its place it pants, rising it there [again].

Eccl 1:6A, It [the sun] goes toward south and turns around toward north.

Eccl 1:6B, Turns around [and] turns around goes the wind, and on its circuits returns the wind."

Page 55 of Zlotowitz translates Eccl 1:5-6, "And the sun rises and the sun sets - then to its place it rushes; there it rises again. It goes toward the south and veers toward the north; the wind goes round and round, and on its rounds the wind returns." On the next page appears the comment, "*Midrash Leckach Tov* [by Toviah ben Eliezer, 11th century] interprets this verse [verse 6A] as referring to the course of the sun as manifested by the winter and summer seasons, but it adds that on a deeper level the verses [5-6] refer to the Jews [they have moved from place to place due to persecution]."

About the year 400 CE Jerome translated the Tanak from Hebrew to Latin, which, except for the Psalms, became the Latin Vulgate. Page 307 of Japhet gives the following careful translation from Jerome's Vulgate for Eccl 1:5-6, (additions in square brackets are made by Japhet), "The sun rises and [the sun] sets and returns to its place. It rises there, goes to the south and turns about to the north. As it circles the world around goes the spirit, and upon its circuit returns [the spirit]." Jerome made this rhyme in the Latin.

In general I never use the Septuagint translation (abbreviated LXX) as a means of understanding some seldom used Hebrew words or difficult passages of the Tanak because it often shows mere guesses for the Greek translation, so it is not reliable as an ancient indicator of the meaning of the Tanak. With proper care there can be some instances in which the LXX may resolve an ambiguity. Among all of the books of the LXX, Ecclesiastes stands apart in a special way. Page 7 of Seow reveals, "The translation technique of LXX Ecclesiastes is unique among the books in the Bible, so that one may say with a reasonable amount of certainty that the translator is not the same as for any other books. The translation shows a number of features that are typical of the works of Aquila of Pontus, a second-century (CE) gentile convert to Judaism. Aquila, a pupil of the famous Rabbi Aqiba is best known for his translation of the Hebrew Bible into literalistic Greek [about 135 CE], among other reasons, to provide Jews who spoke Greek but did not read Hebrew or Aramaic with a translation that would reflect the Hebrew as much as possible. Thus, the Hebrew word order is rigidly adhered to and all details in Hebrew are represented, even when they seem

awkward or even nonsensical in Greek.” While scholars debate whether Aquila was the translator, we do know that the LXX for Ecclesiastes is literal and sticks very closely to the Hebrew. The commonly available translation of the LXX by Brenton translates Eccl 1:5-6, “And the sun arises, and the sun goes down and draws toward its place; arising there it proceeds southward, and goes round toward the north. The wind goes round and round, and the wind returns to its circuits.” This translation reflects the fact that the word for “wind” does not occur in the Greek until after the word for “north”. In fact, the Greek word order after “north” is “round round courses the wind”, so Brenton's translation does put “wind” earlier in the verse than the Greek indicates. The Greek word *pneuma*, Strong's number 4151, is used for wind, which is the translation of the Hebrew word *ruach*, Strong's number 7307. Page 300 of Japhet translates the LXX more literally, “And the sun rises and the sun sets and draws to its place. It rises there, goes to the south and turns about to the north. Turns about, turning goes the *ruach* (*pneuma*), and upon its circuit returns the *ruach* (*pneuma*).” In footnote 31 on page 301 Japhet remarks, “This faithfulness to the MT [Massoretic Text of the Hebrew] is particularly striking when it creates forms which are awkward in the Greek.”

Pages 298-299 of Japhet point out that Rashi, the well known Jewish commentator of the late middle ages, also treats the sun as the subject in Eccl 1:6.

The Syriac language is an offshoot of first century Aramaic and is thus a Semitic language that has affinities to Hebrew. The Syriac Peshitta is a translation from the Hebrew Bible that was made about 200 CE. The Peshitta in its literal word order, is in agreement with the Hebrew text of Eccl 1:5-6 in continuing with the sun as the subject of Eccl 1:6A; however, George M. Lamsa's translation from the Syriac Peshitta departs from the literal view and translates it as if the wind were the subject at the beginning of verse 6. Lamsa often departs from the Syriac to agree with the KJV.

Page xi of Sternberg translates Eccl 1:5-6A, “The sun rises and the sun sets and hastens to its place and rises there. It walks to the south and returns to the north.”

In Sternberg's above translation the word “walks” comes from the Hebrew word *halach*, Strong's number 1980, which is typically used in reference to people walking, yet it is used in other ways for the movement of inanimate

objects. However, from the viewpoint of an observer on earth, the position of the sun at sunset from day to day does change in distinct increments as a “walk”, and the position of the shadow cast by a narrow object at noontime from day to day also changes in distinct increments as a “walk”. These changes do form a south-north yearly cycle as will now be explained.

[38] The South - North Yearly Cycle indicated in Eccl 1:6A

A person who views sunsets daily from a place at which there is a clear view of the horizon might notice that the sun does not set at the same part of the horizon each day. He might think of performing the following experiment to determine the daily change in the position of the sun at sunset.

Permanently place a straight board and an object with a sighting point so that the middle of the board is about the length of a person west of the sighting point, and when looking approximately west with one's eye at the sighting point, the long top edge of the board is even with the horizon. Each day near sunset make a mark on the board where the board crosses the line of sight from the sighting point to the middle of the sun. For accuracy this should be done when the center of the sun is at the horizon.

If this is done from anywhere in the north temperate zone, for example Jerusalem (latitude 31.8 degrees north), during the coldest part of the year, the daily marks on the board keep going north (to the right). During the hottest part of the year the daily marks on the board keep going south. For several days while the temperature is getting quite hot, the marks will be at about the spot that is the furthest north of the marks; the middle day of this group is the day of the summer solstice. For several days while the temperature is getting quite cold, the marks will be at about the spot that is the furthest south of the marks; the middle day of this group is the day of the winter solstice. The word “solstice” means “stopping of the sun” which describes the state of the marks at the solstices. At all other times of the year the marks are separated from one another while heading north, or separated from one another while heading south.

The marks on the board are furthest from one another at the midpoint between the solstice marks because the south-north motion of the sun is fastest at these points. The mark closest to the midpoint while the marks are heading north is the mark at the vernal equinox. The mark closest to the midpoint while the marks are heading south is the mark at the autumnal

equinox. Although this method determines the equinoxes quite precisely by first knowing the solstices, it is not necessary to know the day of the solstices precisely because the marks barely change for several days about a solstice. Page xii of Sternberg is one of several sources that discusses this.

[39] Equinox and Solstice is in the Bible

Any exhaustive concordance will show that summer and winter are used in the Tanak. They are prominent as opposites in Gen 8:22 and Ps 74:17. These represent extremes of temperature and are used for contrasting purposes. The other two seasons are not extremes and are therefore not suitable for use as opposites.

The Hebrew word *tshuvah* [Strong's number 8666] is translated as *spring* in many translations. The entry for *tshuvah* in volume 2 on page 910 of TWOT (authored by Victor P. Hamilton) states of this Hebrew word, "Appears eight times, five times in reference to the spring as the 'turn' of the year (II Sam 11:1; I Kgs 20:22, 26; I Chr 20:1; II Chr 36:10); once 'return' to a place (I Sam 7:17), and twice in the sense of 'answer, retort' (Job 21:34; 34:36)." On page 1000, at the top of column 2 of BDB, the second meaning of this word *tshuvah* is given as "of spring". On page 1800 in volume 2 of HALOT, the second meaning of this word *tshuvah* is given as "spring". The fourth season, autumn, is never mentioned in the Tanak, but that certainly does not imply that ancient Hebrew had no word for autumn. There are about 100 Hebrew words in the Tanak that only occur once or twice, and many of these might easily have been omitted altogether. Surely many ancient Hebrew words existed that never appear in the Tanak. The boundary points of the four seasons are the two equinoxes and the two solstices. With words for the seasons in ancient Hebrew, there is necessarily an implication of a word or two for the boundary points of the seasons.

The Hebrew word *tkufah*, Strong's number 8622, occurs four times in the Bible, Ex 34:22; I Sam 1:20; II Chr 24:23; Ps 19:7. In 1907 when the BDB lexicon was published (see page 880 for *tkufah*), the Dead Sea Scrolls were not yet discovered and clarifying insightful meanings into some ancient Hebrew words were not yet available. The Dead Sea Scrolls use the Hebrew word *tkufah* in contexts before the first century, and this is now discussed.

The paper by Hoenig discusses a scroll labeled I QH among the Dead Sea

Scrolls. On pages 312-313 he explains two expressions found there: one is “*tkufah* of the day” and the other is “at the appointed time of the night at *tkufah*”. Hoenig explains that the former means “zenith of the day” meaning “noon” and the latter means “at the appointed time of the night at zenith” meaning “midnight”. It is particularly interesting that in the expression “at the appointed time of the night at *tkufah*” the Hebrew word for “appointed time” is *moed*, the same word used for the holy days in Lev 23 and for seasons in Gen 1:14. Thus it is not foreign to ancient Hebrew to use or associate *tkufah* with *moed*. This use of *tkufah* shows two heavenly bodies, the earth and sun, interacting on a daily basis so that at astronomically distinctive points in time *tkufah* refers to those points in time.

In the book chapter by Johann Maier one of the Dead Sea Scrolls is discussed that contains the Hebrew word *tkufah*. On page 146 Maier writes, “The Songs themselves are attached to the thirteen Sabbaths of one quarter or season (*tkufah*) of a year, according to the editor the first quarter (the Nisan season) only.” Here we see the Hebrew word *tkufah* used for the season of spring, which begins with the vernal equinox and ends with the summer solstice. Here also astronomically distinctive points in time involving the earth and sun define a time period called *tkufah*.

The intertestamental apocryphal Book of Sirach (also known as Ecclesiasticus) contains the Hebrew word *tkufah*. This book was written in Hebrew about 190 BCE, but today only incomplete sections of it have survived, having been discovered with thousands of other Hebrew texts in the attic of a synagogue in Cairo, Egypt toward the end of the nineteenth century. The treasure of texts in that attic, which survived for many hundreds of years, is known as the Cairo Geniza. There are many copies of Sirach in Greek translation, and most of the Hebrew words in Sirach 43:7 are preserved, one of them being *tkufah*. The Greek translation for *tkufah* is *suntelia* (Strong's Greek number 4930), which means completion, fulfillment, or destruction. These words indicate a point in time at which some event occurred. In harmony with this idea, the Jerusalem Bible translates Sirach 43:7, “the moon it is that signals the feasts, a luminary that wanes after her full”. Here “her full” refers to the full moon and is translated from *tkufah* or *suntelia*. Here *tkufah* refers to a natural distinctive time of the moon in its movement about the earth.

These contexts from the Dead Sea Scrolls and from Sirach from before 70 CE show that the Hebrew word *tkufah* is used to refer to natural distinctive

points or time intervals associated with the heavenly bodies of the earth, sun, and moon.

On page 394 of the lexicon by Holladay the word *tkufah* is defined. The parentheses and square brackets are part of the text of that book by Holladay where he writes about *tkufah* “turning (of sun at solstice) Ps 19:7; (of the year, i. e. end of year, at autumnal equinox) Ex 34:22; (of the days [i. e. of the year] = end of year I Sam 1:20”.

In Ex 34:22 Moses was told, in literal translation, “And you shall celebrate ... the Feast of Ingathering *tkufah* the year”. There is no Hebrew preposition attached to *tkufah* here so that the relationship between this feast and *tkufah* is very indefinite although translations attempt to make it definite by adding some preposition that is not in the Hebrew. This verse does not define an explicit relationship between these events, but merely indicates that there is some vague closeness in terms of the general year. In harmony with the astronomical uses shown above, this refers to the autumnal equinox. Certainly Moses was aware of the equinoxes from the knowledge he gained in his upbringing in Egypt (Acts 7:22), and the fact that the greatest pyramids had one wall aligned exactly east-west. Only on the days of the equinoxes does the shadow of a vertical object fall exactly east-west all day long. The ancients were easily able to determine an east-west line. Therefore the equinoxes are visible signs of the sun in relation to the earth and do fall within the purview of signs in Gen 1:14 “lights in the expanse of the heavens ... for signs and for festivals and for days and years”.

The main points are:

(1) Eccl 1:5-6 demonstrates a knowledge of the annual cycle of the sun based upon its shadows, as a prior chapter explained. A natural study of these shadows without the use of mathematics leads to the determination of the equinoxes and the solstices. Acts 7:22 shows that Moses was taught Egyptian knowledge, which included the determination of the equinoxes because the greatest pyramids had one wall that was aligned exactly east-west, and the sun’s shadow only falls on this east-west line on the day of the vernal equinox and on the day of the autumnal equinox. The use of the Hebrew word *tshuvah*, meaning spring, also demonstrates familiarity with the vernal equinox. Even if the Hebrew word *tkufah* never appeared in the Tanak, the concept of the vernal equinox in ancient Israelite society is still implied by Eccl 1:5-6 and Acts 7:22 along with associated history.

(2) The Hebrew word *tkufah* found in Scripture does have use outside the Bible before Herod's Temple in Jerusalem was destroyed in 70 CE.

(3) Contexts with *tkufah* show it to mean distinctive points in time in relation to movements of the heavenly bodies as observed from people on earth. Also, it is used for the time period between the distinctive points, e.g., the Nisan *tkufah* or spring season. The word *tkufah* has multiple uses, as the examples showed.

(4) Moses used this word. While he did not specifically use it to refer to the vernal equinox, Ex 34:22 refers to the autumnal equinox, at least showing that Moses had a word in Hebrew that refers to an equinox.

Does Ex 34:22 refer to the end of the harvest when it uses the word *tkufah*? There is no ancient context that forces *tkufah* to mean a “point” of time defined by harvest in contrast to ancient contexts that show it to relate to heavenly bodies. This is simply a matter of finding contexts that bring out meaning that is clear. Incidentally, the three main crops harvested at that general time of the year are figs, olives, and grapes. Figs are a summer fruit, whose harvest hardly ever extends into the fall. The olive harvest occurs in September and October, and is over in most parts of Israel by about the third quarter of October. The grape harvest begins with sour grapes in July but with ripe grapes in some areas of Israel from the beginning of August. The grape harvest continues through about the first third of November in the area of Jerusalem. The uses of *tkufah* in the Dead Sea Scrolls show the meaning of a point in time. In contrast to this, the harvest of fleshy fruits in ancient Israel is widely spread out over time from mid-summer into almost late autumn. Thus the meaning of *tkufah* best includes the boundary points of the four seasons as well as the other meanings demonstrated above.

The mention of the seasons of summer, winter, and spring in biblical Hebrew implies recognition of their boundary points, which are the equinoxes and the solstices. The four biblical contexts of the Hebrew word *tkufah* may seem a little vague, but ancient Hebrew outside the Tanak does include its meaning of equinox and solstice. Reasoning from Gen 1:14 does imply some annual sign of the sun, which can only be an equinox or a solstice, even without the appearance of the word *tkufah* there. Even if the word *tkufah* did not exist at all in the Tanak, it would not defeat the implication of equinoxes and solstices from Gen 1:14 because festivals are implied with the plural of the Hebrew word for *moed*, literally translated appointed-times [4150 *moed*], and this requires a knowledge of some method to determine the first month from the heavenly lights. Knowledge of

the time of the festivals that are determined from the lights in the heavens implies an annual sign from the sun, i. e., an equinox or solstice, regardless of whether *tkufah* occurs there.

Gen 1:14 (along with related Scriptures) shows the following two examples of beginning a new time cycle when a direct signal from a heavenly body is seen. (1) The beginning of the daily cycle that also begins the Sabbath day occurs with the transition from light to darkness, which is a direct signal from the sun. (2) The monthly cycle begins with the first new light from the moon in the evening (when the new day begins, provided the new month is officially declared), which is a direct signal from the moon.

This pattern of beginning a new time cycle when a direct signal from a heavenly body is seen may be extended to the determination of the first month. The only consistent visual annual sign of any light from a heavenly body at roughly the time of the year that “the Israelites went out of Egypt” (note Ex 23:15; 34:18 with Ex 9:31-32) is the vernal equinox. The extension of the pattern implies that the vernal equinox is the visual marker that separates the new moons of one year from the new moons of the next year. In other words, the vernal equinox is a direct signal from the sun that the new moon that is seen and officially declared from that time onward is the first new moon of the year. More specific biblical and historical details that corroborate this will be seen later.

[40] Equal Daytime and Nighttime is Not the Biblical Equinox

The word “equinox” comes from the Latin language and means “equal night” in that language, which implies that daytime and nighttime are equal at the time of an equinox. But did the ancient people that used this Latin name equinox use the meaning of this word in practice, or was it a mere guess that daytime and nighttime are equal on the days of the equinox? It will be shown that this was a mere guess.

Near the dates of the equinoxes the difference in time from sunrise to sunset from one day to the next is about two minutes. In order to determine the date upon which daytime and nighttime are equal at a certain latitude, it is required that a clock exist that can measure time during a 12 hour period to an accuracy that is better than two minutes per day. When ancient Babylonian astronomers recorded an eclipse or the disappearance of a planet behind the moon, they wrote down the time it occurred as well as the month,

day of the month, and year of a king's reign. The paper of Stephenson explains that the smallest Babylonian unit of time was called an *us* and equaled 1/360 of a day, which is four minutes. Moreover, the Babylonians never expressed time as a fraction of an *us*. This shows that they made no attempt to express time more accurately than to the nearest four minutes with their water clocks. The paper of Steele showed a summary of a computer study of Babylonian astronomical phenomena from 562 BCE to 41 BCE, all recorded with a time of day. The conclusion was that the average accuracy of the recorded time was two *us*'s which represents eight minutes from the true time. Moreover, accuracy remained the same during this 500-year period; their water clocks used for this purpose did not improve. One reason that water clocks were not accurate is that as temperature changed, the dripping rate changed. Another reason is that the construction of the mechanism and the recording method were not accurate. Page 609 of Ward shows a graph of how the accuracy of time mechanisms improved through history, based on historical improvements. This chart shows a sudden leap to about two minutes per day in the year 1656 when Christiaan Huygens perfected the pendulum clock. Ancient peoples did not have the ability to determine the day at which daytime and nighttime were equal because their clocks were not accurate enough. The day upon which daytime and nighttime are equal depends on the latitude of the observation because refraction of light increases as one gets closer to the north and south poles.

As already explained from Eccl 1:5-6, the Bible indicates that the sun's annual position was noted on the basis of its south-north movement which was not a matter of measuring the time of day.

The Hebrew noun *tkufah* has an inner stem in common with the Hebrew verb *nahkahf*, which occurs 19 times in the Hebrew Bible. The latter means "to surround" 11 times - I Ki 7:24; II Ki 6:14; 11:8; II Chr 4:3; 23:7; Job 19:6; Ps 17:9; 22:16; 88:17; Isa 15:8; Lam 3:5. It means "to go around" four times - Josh 6:3, 11; Ps 48:12; Isa 29:1 ("add year to year, let feasts 'go around'"). It means "to destroy" twice - Job 19:26; Isa 10:34. It means "to curve" once - Lev 19:27. It means "to finish" once - Job 1:5. The overall flavor of this word indicates the idea of encirclement, which does not have any implication about accurate clock time measurement. The relationship between *tkufah* and *nahkahf* indicates that encirclement of heavenly bodies provides the basis of the meaning rather than the Latin meaning of equinox (equal night with day). When the word equinox is used, its original Latin meaning is discarded, and instead, the time of its practical determination

anciently is meant. This time agrees with the modern astronomer's time for the equinox although the modern astronomer uses a technical definition that ancient peoples could not have used.

Page 124 of Pannekoek states, "Another instrument they [the Greek astronomers living in Egypt after the time of Alexander the Great] used was an equatorial ring, placed before the temples in Alexandria, in Rhodes, and perhaps in other towns, for calendar purposes. It consisted of a cylindrical belt, with its upper and lower borders exactly in the direction of the equatorial plane; the shadow of the southern half upon the inner side of the northern half left a narrow line of light at the upper or at the lower side of the equator. Thus the exact moment of the equinoxes could be fixed." This modern description of this ancient instrument uses the term "equatorial plane" which the ancient Greeks did not use; they bisected shadow angles at the solstices in order to construct this instrument, which is today called the equatorial ring. A discussion of the equatorial ring in use by the Greek astronomers and its inaccuracy due to refraction of the light from the sun is discussed on pages 15-17, 24-37 of the book by John Britton 1992. This problem of refraction could cause an error of one day if an equatorial ring were used.

Pages 73-74 of Pannekoek state, "The Babylonians, according to Greek testimony, used a vertical pole for measuring shadow length; thus they could determine the moments of solstice and, as medium points between the solstices, the moments of vernal and autumnal equinoxes."

The paper by Neugebauer 1980 proposes a simple geometric method by which the Great Pyramid could have been constructed so that it could have achieved its great accuracy in cardinal directions (precise east-west and north-south). Only on the days of the true equinoxes (not when daytime and nighttime are equal) does the shadow of a vertical object fall exactly east-west all of the daytime. This will be discussed further in the next chapter.

Pliny the Elder, writing about the middle of the first century, defines the equinox in two ways that are somewhat contradictory on page 309 of Pliny_1. He writes that "at the season of the equinox sunrise and sunset are seen on the same line", and this is the east-west line; this definition is practical and accurate, and while stated in a way that is very different from a modern astronomy book, it is nevertheless the same in the time. Pliny also writes "the equal hours of day and night at the equinox". When rounding off

to hours this is correct, but not when rounding off to minutes in the latitude of the Mediterranean Sea where Pliny lived.

On page 81 of Pasachoff we find, “These points are called equinoxes because the daytime and the nighttime are supposedly equal 12-hour lengths on these days. Actually, because the refraction by the earth's atmosphere makes the sun appear to rise ahead of the middle of the sun, at U.S. latitudes the daytime exceeds the nighttime by about 10 minutes on the days of the equinoxes. The days of equal daytime and nighttime precede the vernal equinox and follow the autumnal equinox by a few days.” This is about four or five days for the U.S.

[41] The Vernal Equinox and Ex 12:2

Gen 1:14 mentions the lights in the heavens, and these are the sun, the moon, the stars, the planets, and comets. The cycles of the planets and comets are much too irregular in comparison to repeatable phenomena on the earth to consider in relation to a biblical calendar when considering the lights in the heavens. The stars must be excluded because during every 1000 tropical years the time of the appearance of the stars slowly shifts about 14.1 days further into the tropical year thus losing touch with the earth's seasons; this is called precession of the equinoxes in books on astronomy. Only the sun and moon remain to be considered. The moon determines the months but not which month is the first. Only the sun remains to be considered. The only repeatable time points involving the sun are the two equinoxes and the two solstices. Considering that the barley and wheat in Israel are harvested in the spring, the vernal equinox is the only logical candidate to consider that involves the lights in the heavens on the direct basis on Gen 1:14.

We must seek to know what Moses knew. Acts 7:22 reads [NKJV], “And Moses was learned in all the wisdom of the Egyptians, and was mighty in words and deeds.” Pages 333, 336-337 of Lockyer show that most of the Egyptian pyramids are oriented east-west, and the two largest pyramids at Giza built by Cheops and Chephren are oriented east-west, having one wall aligned exactly east-west. Pages 63-64 of Lockyer explain that the sun's shadow on a vertical object from sunrise to sunset falls exactly east-west only on the days of the equinoxes. So it is clear that Moses knew how to determine the days of the equinoxes. When one considers that Gen 1:14 points to the lights in the heavens to determine the festivals and knowing that only the vernal equinox is related to the time of the year under

consideration, Moses would naturally think of the vernal equinox in relation to Ex 12:2. That would be Egyptian training, Egyptian thinking, Egyptian context, and in harmony with Gen 1:14, the only explicit Scripture that directly addresses the determination of the festivals. Would Moses think of the vernal equinox if it had not yet occurred by that day? No, it would be premature for him to think of it. The natural thinking from Ex 12:2 in the context of Egypt and what Moses knew would point to the vernal equinox as having occurred.

Would Moses think it was necessary for him to explicitly mention the vernal equinox in the context of Gen 1:14? If this is the only choice there was, he need not think it was necessary. But the real biblical evidence will come when we get to Ezra and Nehemiah..

[42] Karl Schoch's Curve for Predicting Visibility of the New Crescent

During the years 1907-1927 the German astronomer Karl Schoch (1873-1929) developed astronomical tables to predict the visibility of the new crescent. This was first published in German in 1927 and then in English in 1928. Before his death in 1929, he revised his tables downward into one simpler table. When the points are connected in this simpler table, it becomes a curve, which I call Schoch's curve. The revised table is found on page 162 of the paper by Fotheringham, and it is reproduced in appendix D. This is the table that I personally use. It is only useful in the approximate latitudes of Israel and Babylon and below 4000 feet above sea level. (Schoch's revised table is very close to the table that was independently created by Paul Victor Neugebauer.) Although the original theoretical basis of Schoch's curve was eventually rightly criticized because it was partially based upon Babylonian records that were predictions rather than observations, further study based upon his table has verified its usefulness despite the fact that there is a borderline region during which it cannot accurately predict the visibility of the new crescent.

The paper by Fatoohi 1999 examines 209 examples of records of actual sightings of the new crescent by the ancient Babylonians. This involves the correct latitude for applying Schoch's curve, and the altitude is below 4000 feet. On page 66 of this study all 209 examples are plotted on a graph. This graph shows the original first curve of Schoch in 1927 compared with the curve of Paul Victor Neugebauer (this is close to Schoch's revised curve, which I use). It should be noted that the ancient Babylonians did not have

the air pollution that prevails in modern society and even c. 1900 in Europe with its factories and smokestacks. The effect of today's general air pollution on visibility of the new crescent is not known. In the graph of the 209 cases, 8 of them fall below both the original Schoch curve and the curve of P. V. Neugebauer, the lowest two cases by about 0.9 degrees. I presume that today's air pollution would prevent those two cases. The fraction 8/209 is 3.8 percent of error below the curve. In this test there was no opportunity to know the number of cases in which people looked for the crescent above these curves and no one saw it. This graph also shows 8 examples above the lower curve, but not more than half a degree above the lower curve. Thus there are 16 examples out of 209 (which is 7.7 percent) that were borderline cases based upon plus or minus half a degree yet counting the two very low exceptions. If we exclude those two very low cases thinking that they would not be seen with today's air pollution, we have 14/209, which is 6.7 percent. We may tentatively conclude that about 7 percent of the cases are in the borderline region of plus or minus half a degree. This implies that Schoch's curve should be reliable about 93 percent of the time.

Schoch's curve is based upon certain angles of the sun, earth, and moon with respect to one another at the time of sunset, assuming clear weather, no air pollution, a reasonably low altitude above sea level (from today's knowledge we can say, under 4000 feet, which is higher than Mt. Zion), and the observation region is approximately in the latitudes of Israel and Babylon. Schoch observed both with and without binoculars, and correlated data with the results of others. His curve assumes naked eye observations (no binoculars, except perhaps for initial location to examine without binoculars). Above that curve one can expect visibility of the crescent; below that curve, no visibility. In live practice, there is a narrow band near Karl Schoch's curve where it is near borderline and uncertain, so that some people with sharp vision looking at the right spot do see it, and others do not. Before Internet reports of crescent visibility were available, I used a computer program that utilized Karl Schoch's curve. I still use it and can tell whether it is near borderline, which generally should not exceed plus or minus 1/2 of a degree on Schoch's curve. If the humidity is very low or during the autumn when a low crescent looks like a flattened backwards C in the northern hemisphere, it may be seen as much as 1/2 of a degree below Schoch's curve, or possibly slightly lower. At the moment of the sighting of the crescent, if it is above 4 degrees in altitude above the horizon, then the distortion due to refraction is perhaps tolerable enough to consider that it

might truly be recognized as the crescent. Below 4 degrees it is very doubtful that it could be recognized.

The principles of Karl Schoch's curve are explained next, without involving ourselves with mathematics. It is simply that the *contrast* between reflected light of the moon and the background sky must be *different* enough to perceive the arc of light.

For example, why don't people see the stars during the day? The stars are most certainly there during the day, but we do not see them because the contrast between the light of the stars (not their size which is much smaller than the center width of arc of the moon!) and the background sky is not enough. In other words, the sun's light is too brilliant to see the stars' light.

The most important word here is *contrast* or *difference*. That is why a nighttime bicycle rider is told to wear reflective or brilliant colored clothes. It does *not* matter whether the rider is fat or thin, but what matters is the *contrast* between his clothing and the blackness of night.

The same is true in seeing the light of the moon. Some computer programs (like Yallop's criterion) are based upon the apparent width across the center of the moon (or the percent reflection of the light of the moon, for example full moon 100 percent reflection).

When the sun sets, and you look at the background sky to the west, the brilliance of the sky is *not* the same everywhere. The further you look from where the sun sets, the *less* brilliant the background sky at that point. Also, it is more brilliant directly above where the sun sets, than the same distance above, but also some distance to the right or left. It is these angles away from where the sun set that is an accurate measure of the *brilliance* of the background sky. If the moon is at a place where the background sky is not very brilliant, then and only then, can you see it. Thus the key is knowing the angles (the curve based on the graph coordinates of two angles) of where the sun is compared to where the moon is. This gives a measure of the contrast between the background sky and light from the moon.

Summary: Use the appropriate angles to determine the contrast, which was used to determine Schoch's curve.

If you take some width of the crescent and put it where the contrast is great, you see it. But if you take the same width of the crescent and put it where the contrast is small, you do not see it. Hence the *width* is *not* the main factor, but instead the *contrast*. This concept is very simple, but the mathematics and astronomy are complex.

I do not use a program that predicts visibility of the crescent! Instead I use a program that gives me the accurate angles I want. Then I use the printed table that Karl Schoch determined (which really makes a curve by connecting the dots) to see if the moon is above the curve or below the curve. *Above* means visible. *Below* means not visible. But borderline is about 1/2 a degree above or below the curve (under 4000 feet) based upon extremes of humidity. As was mentioned above concerning the paper by Fatoohi and others, in ancient Babylon there were two cases among 209 in which people had reported seeing the new crescent at 0.9 degrees below Schoch's curve, but the air is more polluted today.

The key for borderline cases is humidity. The further you go below Schoch's curve, the lower the humidity must be to see it. For the areas with extremely low humidity one can go 1/2 a degree below Schoch's curve and still just barely see it.

Before modern high-speed communication and astronomical theory, one would have been reduced to local visibility, although I do not know how to define this and have never seen a definition of this that may be applied in a uniform manner considering the case of overlapping geographical areas for individual congregations. The first goal for a proponent of "local visibility" should be to define it so that the definition covers the issues of distance, height above sea level, bad weather, the use of modern communications, et cetera. Perhaps one may give a definition of local visibility in terms of technology that was available about 1800 before the telephone and telegraph, but even the issue of using race horses for separated groups of people to communicate would begin to complicate matters. Can one apply a definition that might have made sense in 1800 to today's society, thus forbidding telephone calls and driving automobiles to learn what others have seen? While some people might say "yes" and want to pretend that we are locally primitive, even that is an arbitrary rule, and many people would want to communicate with others to determine what they individually should do.

[43] Ezra and Nehemiah in Relation to the Vernal Equinox and the Babylonian Calendar

Ezra 6:15 mentions the month Adar and Neh 6:15 mentions the month Elul. These are Hebrew transliterations of month names in the Babylonian calendar, but these verses are in the context of Jerusalem with the stamp of approval from Scripture. This chapter provides historical evidence that the Jews adopted the month names of the Babylonian calendar into their own calendar, apparently from the time of Ezra and Nehemiah onward. This would cause an obvious confusion unless it was true that nearly all of the time the months in Jerusalem would agree with the months in Babylon during the century of Ezra and Nehemiah. The goal is to learn when the first month of the biblical calendar begins by determining when the first month of the Babylonian calendar began during the century of Ezra and Nehemiah. Later, other corroborating evidence will be presented.

Appendix C provides the details that show the first month of the Babylonian calendar in the years from 499 BCE to 400 BCE, and it includes a discussion of the 19-year cycle. This appendix shows that near the middle of this century Ezra and Nehemiah journeyed from Babylon to Jerusalem.

The results from appendix C yield the following rule to determine the day of the vernal equinox in the Babylonian calendar during this century. Find the date containing the noontime that is closest to the time of the vernal equinox. That date is counted as the date of the vernal equinox. This appendix also provides the details showing that the first day of the first month of the Babylonian calendar during this century followed the pattern that the new crescent of Nisan was the new crescent that fell on or soonest after the day of the vernal equinox. This implies that first the new crescent was sighted, and later that same day the vernal equinox was determined to have occurred.

The Jews were apparently willing to replace the use of the word Abib (Hebrew *aviv*) for the first month with the name Nisan in the context of Jerusalem because they accepted the Babylonian month names. Neh 8:2, 9 show that Ezra kept the holy day of the first day of the seventh month at the correct time. From this time onward Israel used the Babylonian month names for their calendar, which would have led to confusion unless the Israelite calendar and the Babylonian calendar began Nisan at the same time, almost always, during the century in which Ezra and Nehemiah lived.

The claim has been made that the Persian Empire forced the Jewish leadership in Israel to accept the Babylonian month names into their religious calendar and discontinue all of the original month names. Ezra 7 gives the text of a letter from the Persian King Artaxerxes to Ezra the priest, and in verse 16 the king writes that the religious laws are in the hand (power) of Ezra, showing that the king is respecting the independence of the priest in carrying out the laws of the Bible. Neh 5:14 shows that Nehemiah was appointed governor by the king, and in Neh 13:30 Nehemiah writes, “Thus I cleansed them [the Israelites] of everything pagan.” Israel had religious autonomy and self-determination. If the Babylonian Nisan was oftentimes not the Jewish first month, then the Jews would have kept both sets of names to avoid confusion with their numbering of religious months. Or instead, the Jews could have merely used numbers of the months without names for the religious calendar. Another response to this is that the Persian Empire had no control over Scripture, and through inspiration of the Holy Spirit, Ezra 6:15 and Neh 6:15 could have used the month number rather than the month name in the context of Jerusalem. These verses give approval to the use of Babylonian month names and provide a calendric witness to us.

The book of I Maccabees covers the history of Israel from about 175 BCE to 130 BCE and was originally written in Hebrew. It shows the military struggle of the Jews to gain independence from Seleucid domination. The Jews had some degree of success, but it was a continual struggle. In this context of greater Jerusalem the Jews use Babylonian month names for their calendar in I Macc 4:52, 59; 7:43, 49; 14:27; 16:14 when the Babylonian Empire and the subsequent Persian Empire no longer existed. Josephus also uses these month names and calls them Jewish, and these names have been kept by the Jews until today. The existing biblical and historical evidence is that the Babylonian month names were not merely a secondary secular alternate method to designate dates apart from the biblical month numbers (as we today use January to December apart from the biblical month numbers), but that the Babylonian month names and the biblical month numbers were synonymous in designating months. For example, I Macc 4:52 reads, “Early in the morning on the 25th day of the ninth month, which is the month of Chislev, ...” This does not say that in this particular year the ninth month happened to be Chislev, but that the ninth month is Chislev. To emphasize this point even more vigorously, verse 59 states, “Then Judas and his brothers and all the assembly of Israel determined that every year at that season the days of dedication of the alter should be observed with joy and gladness for eight days, beginning with the 25th day of the month of

Chislev”. Thus this festival of Hanukkah (Feast of Dedication in John 10:22) was always to begin on Chislev 25, thus requiring Chislev to always be the ninth month.

The book of Esther discusses the origin of the Feast of Purim, which has been kept by Jews from that time in 473 BCE in Babylon until today. For the year 473 BCE see the note to Est 8:12 in NIV (see the bibliography for the specific edition). The date of the writing of the book of Esther is less certain. On page 718 of NIV we find, “Several scholars have dated the book in the Hellenistic period; the absence of Greek words and the style of the author's Hebrew dialect, however, suggest that the book must have been written before the Persian Empire fell to Greece [Alexander the Great] in 331”. In Est 9:19-23 it is clear that the Jews had decided that every year on the 14th and 15th days of the 12th month Adar they would celebrate Purim. Note the specific wording in Est 9:20-21, “And Mordecai wrote these things and sent letters to all the Jews, near and far, who were in all the provinces of king Ahasuerus, to establish among them that they should celebrate yearly the 14th and 15th days of the month of Adar,” and verse 23 concludes, “So the Jews accepted the custom which they had begun, as Mordecai had written to them”.

Thus Scripture teaches that the Jews accepted that the month named Adar would always be the month in which the Feast of Purim would fall. Adar is the name of the 12th month in the Jewish calendar as well as in the Babylonian calendar. The month names and month numbers were locked together; they did not slide around with respect to one another.

[44] Nisan and the Jews at Elephantine, Egypt

About 600 BCE a group of Jewish mercenaries were first employed on the island of Elephantine along the Nile River in southern Egypt about 500 miles south of the Mediterranean Sea close to the border of Ethiopia (see pages 7 and 34 of Bickerman 1962). The purpose of this military base was to protect the southern border of Egypt from invasion from the south. When Persia defeated Egypt in 525 BCE under the leadership of Cambyses, this military base became funded by the Persian Empire instead of Egypt because its need still existed.

A number of letters and other documents written in Aramaic have been discovered on this island of Elephantine during the late 19th and early 20th

centuries. These letters date from the fifth century BCE when the Jewish mercenaries were there. Page 35 of the book by Bickerman states, "The 'Jewish force' (as the regiment is officially styled) was divided into companies, the captains of which bear Babylonian or Persian names; a Persian was 'the chief of the force'." Since it was called a Jewish force, the bulk of the mercenaries were obviously Jewish, but it was under the command of Persians, so it was not autonomously controlled by Jews. This is a significant difference between Elephantine compared with Judea under the governorship of Nehemiah. Judea was autonomous, while Elephantine was totally funded by Persia, under Persian military command, and was not autonomous. This implies that the calendar in use at Elephantine was the Babylonian calendar rather than the Jewish calendar, although evidence provided above shows that nearly all of the time there was no difference between these calendars at that time. However, due to a borderline case of sighting the new crescent or a significant difference in weather that affects the sighting of the new crescent, the start of a month may not always be on the same day. In the paper concerning Elephantine by Richard Parker 1955, on page 274 he wrote, "A Persian military garrison in a Persian satrapy would most probably use the Persian-Babylonian calendar". Parker wrote this in opposition to Horn and Wood 1954 where they argued that the calendar in use at this military garrison was the Jewish calendar. This article was a condensation of the book by Horn and Wood 1953. According to Richard Parker 1955 (and I agree), the basis of the claim by Horn and Wood that the calendar in use was the Jewish calendar rather than the Persian-Babylonian calendar involved one document's double date, and the question of what was written in one very badly worn text that was difficult to restore. Parker disagreed with Horn and Wood on how to restore that text. The Babylonian years of reign of monarchs were from spring to spring while evidence from Neh 1:1; 2:1 indicates that Judah reckoned the years of reign of monarchs from fall to fall. This difference along with how this single text was restored determined whether the calendar in use was the Jewish calendar or the Persian-Babylonian calendar. Since the restoration of the date was debatable, it could not decide the question. Parker's opinion was based on political and military control of the island of Elephantine as well as control of its military garrison.

Concerning these documents from Elephantine, Bezalel Porten 1996 wrote on page 152, "Virtually every contract bore a double date, the first usually being the Babylonian date and the second the Egyptian one." This is stated as a fact without evidence, but the hard evidence that the dates were

specifically in the Persian-Babylonian calendar rather than the Jewish calendar was given in Porten 1990, and that was the reason for the publication of this paper in 1990. This paper reveals that further documents and other artifacts with Babylonian month dates have been discovered from ancient Egypt, and these provide additional evidence to settle the dispute over which non-Egyptian calendar was in use there, although evidence presented above indicates that there was rarely any difference between these calendars during the fifth century when Ezra and Nehemiah returned to Jerusalem after the Babylonian captivity. In particular, page 13 states that these documents come from three major sites in Egypt: Memphis, Teuzoi, and Elephantine. From Memphis and Teuzoi the names of the people indicate virtually no Jewish presence. Syene was the most southern city of ancient Egypt, and it was adjacent to the island of Elephantine. There was another Persian garrison in Syene. Based upon a comparison of some of these documents, Porten wrote on page 27, “For Cowley they were as follows: 'If the Jewish month was mentioned here, it points to the conclusion that the “Syenian garrison” was the same as, or part of, the *hyl' yhwdy'*, and that these accounts relate to the Jewish colony.' The overwhelming number of non-Jewish names in this list leads me [Porten] to the opposite conclusion – the Syenian garrison was composed essentially of non-Jewish Arameans and the restored month of Iyyar belongs to the Persian-Babylonian and not the Jewish calendar.” On page 30, concerning one class of the documents with Babylonian month names, Porten wrote, “As stated, none of these documents concerns Jews. All are part of the Persian judicial or fiscal administration.” On page 32 Porten wrote, “There is no evidence for a Jewish calendar at Elephantine as distinct from the Babylonian calendar.” In summary, Porten came to the same conclusion as Richard Parker (it was the Persian-Babylonian calendar) because: (1) There were two major sites in ancient Egypt far outside of Elephantine with no Jewish presence having Babylonian month names; (2) The Syenian garrison close to Elephantine had almost no Jewish presence yet used Babylonian month names; and (3) One class of documents with Babylonian month names concerned the Persian judicial or fiscal administration, and this is obviously not a Jewish context.

One of the Aramaic letters found at Elephantine is known in scholarly circles today as the Passover Papyrus. The Hebrew-Aramaic alphabetic characters in this letter along with an English translation are found on pages 56-57 of Lindenberger. In the following quotations from the letter, the square brackets and the contents within them appear on page 57 of Lindenberger. The letter contains “This year, year five of King Darius”,

which dates the letter in 419/418 BCE. There are gaps in the letter because it is poorly preserved. The addressing of the letter says “[To] my brothers Yedanyah and his colleagues, the Jewish garrison, from your brother Hananyah”. It was written from one Jew in friendship to the Jews on the island with whom the author had familiarity. Part of the preserved text of the letter says, “Be scrupulously pure. Do not [do] any work [...]. Do not drink any [...] nor [eat] anything leavened [... at] sunset until the twenty-first day of Nisan [...]”. Another translation of this same segment of this letter is on page 283 of Whitters where he adds in square brackets some guesses in gaps in the text as follows, “be pure and take heed. [Do n]o work [on the 15th and the 21st day, no]r drink [fermented drink, nor eat] anything [in] which the[re] is leaven [from the 14th at] sundown until the 21st of Nis”. Note that the final letter of Nisan is missing in the poorly preserved papyrus so only “Nis” is shown. This provides historical evidence that after the return from exile under Ezra and Nehemiah, Jews named the first month Nisan as a substitute for the word *aviv*. On page 283 Whitters comments, “The letter came from one Hananiah, who apparently wanted the Jews in Egypt to celebrate Passover and Unleavened Bread appropriately. The address and greeting rule out a local Egyptian official or Persian overlord.” If the name Nisan was not significant for the first month to Jews, the letter could simply have said the first month or used an expression with Abib (Hebrew *aviv*) to signify the first month.

[45] Gen 1:14; Ezra 6:15; Neh 6:15 Show the Vernal Equinox Starts the Year

Ezra 6:15 and Neh 6:15 tie in with Gen 1:14 to give the biblical and archaeological evidence that together show explicit evidence that Gen 1:14 involves the vernal equinox. The Babylonian cuneiform inscriptions are archaeological clay records that are now mostly in the British Museum. These tablets have eclipse data as well as new moon sighting data that correlate with computerized astronomy to prove the dating of their calendar. From the knowledge of the Babylonian calendar with the use of these month names in Israel we can say that Nisan 1 is the new moon on or the soonest new moon after the day of the vernal equinox (see appendix C). In discussions above it was pointed out that by the process of logical elimination of choices, about the time of Ex 12:2 and within the parameters of Gen 1:14 involving the lights in the heavens, the vernal equinox is the only candidate for starting the year.

Some people have proposed that merely the 16th day of the first month need be on or after the equinox, and not the first day of the first month. Aside from the fact that this is not a natural thing for Moses to imagine, there is the practical problem of having to predict at the beginning of the month whether the 16th day of the month will be on or after the equinox. From one equinox to the next is 365 or 366 days, and it is not an easy matter to predict between the two because there is no repetitive pattern. However, it is only in unusual cases when the first day of the month will be within a day of the vernal equinox.

If it had originally been true that merely the 16th day of the first month need be on or after the equinox to determine the first month, then about half the time the Israelite first month named Nisan would have been one month earlier than the Babylonian Nisan, and consider what confusion there would be in that case. The confusion would be unacceptable.

[46] The Zodiac and the Sign of Aries

The primary reason for discussing the zodiac is to build a foundation for understanding the history and the factors that led to the adoption of a method to determine the first month of the ecclesiastical calendar by the majority of bishops in the Roman Catholic Church. Their goals were to achieve unity and to know when to celebrate Easter, but a determination of first month was needed to know when to celebrate Easter.

The zodiac was already discussed in a previous chapter that was devoted to Isa 47:13, but it was not explored in sufficient depth for discussions to come. As a brief review, the zodiac is the division of the annual path in the sky near the path of the sun into 12 equal parts. Each of these parts is called a sign of the zodiac. For this purpose the “year” is the solar year, that is, the average time from one vernal equinox to the next vernal equinox. Each sign has a name, which is also the name of a constellation of stars in the sky. At the time that the zodiac was being developed by the Babylonians about 460 BCE, each named constellation did appear in the sky during some of the time of the sign that had its same name. However, from one year to the next year these constellations do not appear at exactly the same time in the sky. There is a very slow drift of the time of appearance of each constellation in the sky with respect to the vernal equinox each year. This slow drift in the time of the appearance of the stars each year has been named *precession of the equinoxes*, and it takes about 25,800 years for the appearance of the stars

to cycle around one complete year. The Greek astronomer Hipparchus discovered precession c. 140 BCE. There is no evidence that the Babylonians knew about precession. The main point is that the constellations slowly change position relative to the vernal equinox, but the signs of the zodiac remain fixed relative to the vernal equinox.

The zodiac is divided up into 360 equal parts, each of which is called a degree. This shows that each degree is slightly longer than one day because there are about 365.2422 days per year. Each of the 12 signs is 30 degrees, so that each sign is almost 30.5 days.

The first of the 12 signs of the zodiac is named Aries, which is the Latin word meaning “ram”, so that sometimes this sign is called the Ram. The constellation of Aries is not the sign of Aries. The constellation drifts, but the sign does not drift. When writers are discussing time and they mention the name of a sign of the zodiac, they are never referring to the constellation. When does the sign of Aries begin each year? The answer is not as simple as one may think, because it depends upon the time in history, the location, and sometimes the person who is writing!!

The Roman author named Columella wrote a series of 12 books titled *On Agriculture* in Latin c. 50 CE, which is about the time that Philo of Alexandria died and Josephus was 13 years old. On page 481 of Columella in 9:14:1, he wrote, “From the first equinox, which takes place about the twenty-fourth of March in the eighth degree of the Ram ...” He was using the Julian calendar, and in the first century the vernal equinox in the Julian calendar fell on March 22 or 23, so he was close in writing March 24. He wrote that the vernal equinox occurred in the 8th degree of the sign of Aries. This means that the first day of Aries was seven days before the vernal equinox for Columella. If we take the vernal equinox to be Julian March 23 in the first century, then the first day of Aries is on March 16.

On pages 487, 489 of Columella in 9:14:12, he wrote, “I am well acquainted with the reckoning of Hipparchus, which declares that the solstices and equinoxes occur not in the eighth but in the first degrees of the signs of the Zodiac; however, in these rural instructions I am now following the calendar of Eudoxus and Meto and the old astronomers, which are adapted to the public festivals, because this view, accepted in old times, is more familiar to farmers and, on the other hand, the authority of Hipparchus is not necessary for rustics of less refined education.”

The Roman author Columella informs us here that the Greek astronomer Hipparchus began the sign of Aries on the vernal equinox, but he is beginning it seven days earlier.

The Roman architect Vitruvius wrote a series of 10 books titled *On Architecture* after 27 BCE. On page 233 of Vitruvius (translated by Granger) in 9:100:3, he wrote, “When he [the sun] enters the sign of the Ram and traverses the eighth degree, he makes the vernal equinox.” Vitruvius is in perfect agreement with Columella.

The Roman writer Pliny the Elder (23-79) wrote his encyclopedia *Natural History* c. 50-77 in Latin. This encompassed a vast array of ancient knowledge in 37 books, and it was highly esteemed for hundreds of years after his death. Vespasian, the Emperor of the Roman Empire, granted him a tract of land in Rome for his later years, just as Vespasian granted to Josephus in 70. During Pliny’s last nine years of life, from 70 to 79, it is likely that Pliny and Josephus met since they had the same patron and lived in the same environs. However, Pliny was a traveler by nature, so they may not have met frequently. The nobility in Rome for which Josephus wrote would have been familiar with Pliny's works, so Josephus would have used Pliny's terminology knowing it was familiar to them. On page 225 of Pliny_1 in 2:16:81, he wrote, “The sun itself has four differences, as there are two equinoxes, in spring and autumn, when it coincides with the center of the earth at the eighth degree of Aries and Libra ...” On page 329 of Pliny_5 in 18:59:221, he wrote, “... all these changes occur at the eighth degree of the signs of the zodiac, midwinter at the eighth degree of Capricorn, about December 26, the equinox at the eighth of the Ram, the summer solstice at the eighth of the Crab and the other equinox at the eighth of the scales ...” From these selections from Pliny we note that he agreed perfectly with Vitruvius and Columella.

The ancient Babylonians had two systems of mathematical astronomy for the moon, the earlier one called System A and the later one called System B. System A had the vernal equinox occur in the tenth degree of Aries and System B had the vernal equinox occur in the eighth degree of Aries. This is explained by Neugebauer on pages 594 and 596 of volume 2 of HAMA. Although the historical trail is not known, most of the Roman Empire in the first century followed the practice of Babylonian System B in placing the vernal equinox in the eighth degree of Aries. Page 600 of HAMA mentions

that Hipparchus (c. 140 BCE), Ptolemy (c. 150 CE), and other earlier Greek astronomers placed the first day of Aries on the vernal equinox.

The Greek astronomer Geminus wrote an elementary book on astronomy called *Introduction to the Phenomena* c. 90-35 BCE, according to the translators James Evans and J. Lennart Berggren (page 19). In this work, at 1:19 (page 114), Geminus wrote, “Spring equinox occurs around the height of flowering time, [when the Sun is] in the first degree of Aries.” (The bracketed addition is by those translators.) The survival of this elementary Greek textbook of astronomy that avoided mathematics makes it reasonable to suppose that in the first century in Alexandria where the Greek astronomers were famous in their most significant city, the educated people placed the first day of Aries on the vernal equinox. The sign of Aries in Alexandria no doubt began exactly where modern astronomers place it, at the vernal equinox, which is seven days later than in most of the Roman Empire in the first century. The famous work of mathematical astronomy known as the *Almagest* by Ptolemy, c. 150, had such a strong influence that its use of the vernal equinox at the beginning of Aries prevailed in the Mediterranean region after several centuries, but it was a slow process. On page 90 of Toomer’s translation of the *Almagest*, we note, “We shall use the names of the signs of the zodiac for the twelve [30 degree-] divisions of the ecliptic, according to the system in which the divisions begin at the solstitial and equinoctial points. We call the first division, beginning at the spring equinox and going towards the rear with respect to the motion of the universe, ‘Aries’, the second ‘Taurus’, and so on for the rest, in the traditional order of the 12 signs.” (The addition in brackets is by Toomer.)

In summary, outside of the tradition of the Greek astronomers including Hipparchus, Geminus, and Ptolemy, all favoring the vernal equinox to begin at the start of Aries, were the non-astronomers Pliny, Vitruvius, and Columella, who wrote that the vernal equinox begins at the eighth degree of Aries. The city of Alexandria and possibly parts of Asia Minor promoted the terminology for Aries of the Greek mathematical astronomers, but elsewhere in the Roman Empire, the terminology of Pliny was promoted in the first century.

Could Pliny be regarded as an astronomer? Books 2 and 18 of Pliny’s *Natural History* contain astronomical matters. Olaf Petersen 1986 surveyed Pliny’s astronomical accomplishments. On page 189 Pedersen wrote, “The conclusion to be drawn from the preceding sketch of Pliny’s astronomy must

be that he was no astronomer, but a rather incompetent compiler of astronomical lore culled from a variety of sources, some of which were not of the purest water. Thus it is impossible to give him any place at all in the development of astronomy.” Alexander Jones also commented on Pliny in 1991. On page 148 he wrote of Pliny, “He consulted and took notes on numerous writings on astronomy that have not otherwise come down to us, but he possessed neither the scientific competence necessary to understand the texts nor an adequate Latin technical vocabulary to make them intelligible to his reader.”

[47] Philo explains when the First Month of the Biblical Year begins

There is a Jewish witness whose writings date from the early first century who discusses the meaning of Gen 1:14 and Ex 12:2. This witness is Philo of Alexandria. This witness would be of no consequence and irrelevant if the applied calendar of Judaism at the Temple in the early first century was not correct. It is necessary to establish some relationship between the calendar of Judaism at the Temple and Philo's thinking in order for Philo's comments on Gen 1:14 and Ex 12:2 to be relevant.

In Gen 1:14 where the Hebrew text has the plural of *moed*, which is typically translated seasons, or festivals, or appointed times, the Greek translation of the Hebrew Bible known as the Septuagint has the Greek word *kairos* (Strong's number 2540). The various versions of the Jewish Aramaic paraphrased translations of the Hebrew Bible known as the Aramaic Targums all interpret *moed* to include the meaning festivals. The Jewish commentaries of the middle ages also agree with this understanding of *moed*. In Lev 23 the Hebrew *moed* occurs six times: Lev 23:2, 2, 4, 4, 37, 44. The association of *moed* with festivals is clear from its use in Lev 23 as well as in Ps 104:19 and elsewhere. In contrast to this, *kairos* occurs in Lev 23:4, but nowhere else in the Septuagint of Lev 23. In Greek, *kairos* is a very general word for time, and it is not noted for being associated with the festivals or any other regular repetitive time. Thus one would not particularly expect Philo to interpret *kairos* as festivals, and indeed Philo does not interpret it that way. But he does use the word *kairos* in discussing this portion of Gen 1:14, indicating that his version of the Septuagint Gen 1:14 is similar to the one that is commonly available to us.

Philo discusses Gen 1:14-16 on pages 34-47 of Philo_1 (*On the Creation* 45-61). On pages 44-45 (paragraph 59) Philo wrote, “By ‘appointed times’

[*kairos*] Moses understood the four seasons of the year, and surely with good reason.”

It is a little humorous that he puts this interpretation in Moses' mind as if to say this is what Moses knew it to mean rather than this is Philo's interpretation. Since the four seasons are bounded by the equinoxes and the solstices, he certainly believes that Gen 1:14 includes these astronomical events. On pages 46-47 (paragraph 60) Philo continues, “The heavenly bodies were created also to furnish measures of time: for it is by regular revolutions of sun, moon, and the other bodies that days, and months, and years were constituted.” Since the calendar is based on these units and he declares these units to be based on measures of time of the heavenly bodies, he leaves no place for the barley to be the determining factor for the first month. The reader might be curious about why Philo wrote here “and the other bodies”. While we know that the Greek astronomer Hipparchus proved that the stars drift very slowly from the equinoxes, and he discovered this about 100 years before Philo was born, this knowledge had not been popularized and accepted, so that Philo does not know this. Thus Philo implies the thought that the cycle of the appearance of stars agrees with the sun's signs of the equinoxes and solstices that make the seasons. If Philo had been familiar with the Hebrew text of Gen 1:14, he would have made the association of the Greek *kairos* with the Hebrew *moed*, and then would have linked this to the festivals using the contexts of *moed* in Lev 23. Instead of linking *kairos* to the festivals, he links it to the four seasons, indicating the equinoxes and solstices.

Philo wrote on page 151 of Philo_7 (Special Laws I.90), “Who else could have shewn us nights and days and months and years and time in general except the revolutions, harmonious and grand beyond all description, of the sun and the moon and the other stars?” ***Notice that the way Philo asks this question emphatically shows that agriculture is not the way to determine years and the first month.*** Again Philo leaves no place for the use of barley in calendric determinations. If, on an annual basis, the Jews in Alexandria had to wait for a report on the state of the barley from the priests in Judea in order to know when to leave for a journey to keep the feast of unleavened bread at the Temple in Jerusalem, Philo would not neglect such an important annual event in its role to determine the time of the first month. In this matter the Septuagint has no distortion that would give Philo a reason to have a prejudice against the use of barley, but he surely knows nothing of the role of barley in the early first century to determine the first month.

Having examined Gen 1:14 in Philo's writings, the next step is to consider his comments on Ex 12:2. In order to properly evaluate this, the reader should be familiar with the prior chapter on the zodiac and Aries (= Ram).

Philo was well educated, but not in the area of astronomy. Nevertheless it is probable that he would understand that the first day of Aries was the day of the vernal equinox as taught by the astronomers in Alexandria, which was unlike most of the Roman Empire in the first century where the eighth day of Aries was taken as the vernal equinox. Secular society outside of Alexandria also considered the autumnal equinox to occur on the eighth day of the sign of the zodiac called the Scales.

With the help of a little sloppiness in the existing translations it is easy for readers to become confused about what Philo means. To help explain one confusing part of Philo's writings I made a word for word translation from the Greek. Here is my literal translation of Philo's *On the Creation*, paragraph 116 (in chapter 39) on pages 92-95 of Philo_1: "The sun, too, the great master of the day, bringing about two equinoxes each year, spring and autumn, the spring in [the] Ram and the autumn in [the] Scales, supplies very clear evidence of the sacred dignity of the seventh [number], for each of the equinoxes occurs [near a] seventh month, and during them [these seventh months] there is enjoined by the law the keeping of the greatest national festivals, since [during] both of them [these seventh months] fruits of the earth ripen, [in the] spring indeed grain produce and all else that is sown, and [in] autumn the [fruit] of the vine and most of the other fruit trees."

One peculiar thing to notice here is that Philo uses the word "spring" twice as though it meant "spring equinox" and the word "autumn" twice as though it meant "autumn equinox". Elsewhere he seems to use the word "equinox" to mean the season that it begins; for example, he writes separately of the feast of trumpets at/in the autumn equinox and the feast of tabernacles at/in the autumn equinox. Philo enjoys analogies, symmetry, and approximation in his writings.

Philo discusses Ex 12:2 on pages 2-5 of Philo_QE (Exodus, Book 1.1). On page 2 he wrote, "'This month (shall be) for you the beginning of months; it is the first in the months of the year.' (Scripture) thinks it proper to reckon the cycle of months from the vernal equinox. Moreover, (this month) is said

to be the ‘first’ and the ‘beginning’ by synonymy, since these (terms) are explained by each other, for it is said to be the first in order and in power; similarly that time which proceeds from the vernal equinox also appears (as) the beginning both in order and in power, in the same way as the head (is the beginning) of a living creature. And thus those who are learned in astronomy have given this name to the before-mentioned time. For they call the Ram the head of the zodiac since in it the sun appears to produce the vernal equinox.” Then on page 3 he writes, “And that (Scripture) presupposes the vernal equinox to be the beginning of the cycle of months is clear from the notions of time held in the ordinances and traditions of various nations.”

As a commentary to this last sentence, page 391 of Samuel 1988 states, “In the areas of Syria and the East controlled by the Seleucid kings, the Macedonian calendar was adjusted to make its months coincide with the months of the Babylonian calendar, which was in turn regulated locally by a nineteen-year cycle. The system was in general use in the East, and persisted in an adjusted form in cities all over the eastern regions well into the period of Roman domination.” The first day of Nisan in the Babylonian calendar since 499 BCE fell on or after the vernal equinox. Although Parker and Dubberstein show an exception to this in the year 384 (page 34), this alleged exception should be corrected because it is now regarded to be a faulty examination of a cuneiform text; see pp. 14 and 16 in Aaboe and others 1991.

When Philo speaks of the “traditions of various nations”, from Samuel’s statement he is referring to the continuation of the Babylonian calendar whose first month did not begin before the day of the vernal equinox. This is the only place where Philo makes a statement about the first month that is capable of some explicit comparison with the vernal equinox.

In none of this is there any use of barley to determine the first month, and the Septuagint does not force Philo to take his position. There is never a hint that the Jews in Alexandria waited with anticipation to hear the news of barley reports so they could begin their plans for the Passover.

[48] Declaration of the Vernal Equinox in Ancient Israel

Based upon Num 10 and Ps 133 as discussed above, it should be accepted that the Levitical priesthood had the authority to declare the new moon days and thus regulate the calendar for ancient Israel. This priesthood performed

specific animal sacrifices on the new moon days (Num 28:11-15; 10:10), so the priesthood had an essential role. This role was highly visible and authoritative before all the people as long as the Temple stood, but after it was destroyed in the year 70, the priesthood's prominence in Israelite society ceased. The reason for this cessation is indicated in John 12:42, "... because of the Pharisees they [the Jewish rulers] were not admitting, lest they should be put out of the synagogue." This shows that the Pharisees had much control over the people in the synagogues. The synagogues were away from the Temple where the priesthood dominated. The Temple was not a synagogue. As already shown above, the vernal equinox was significant to determine the first month.

The first question is whether the vernal equinox was determined by observation or by a calculation in ancient Israel. To answer this question, a summary of several points from above along with a few related matters are now brought together.

(A) There is no word in biblical Hebrew for "astronomer", although there is a Hebrew word for "astrologer", *havar*, Strong's number 1895. This word only occurs once, in Isa 47:13, a negative statement against a practice in Babylon.

(B) Neither the Dead Sea Scrolls, nor archaeology from Israel, nor the Bible, nor Philo of Alexandria, nor Josephus indicates any native development of mathematical astronomy in Israel.

(C) Biblical Hebrew for the expression of numbers along with the Dead Sea Scrolls and archaeology indicate that ancient Israel had no positional numbering system with a zero, so that general multiplication and long division, especially of fractions, would have been prohibitive. This is a heavy strike against any suspicion that ancient Israel could have had a native mathematical astronomy.

(D) Ancient Egypt did not possess mathematical astronomy until the Greek astronomers moved to Alexandria after 330 BCE. Thus Israel could not have inherited such knowledge when Moses led them out of Egypt. On page 289 of Swerdlow 1993, he wrote that Otto Neugebauer studied the ancient Egyptian language; thus Neugebauer was able to read the original ancient Egyptian texts and thereby engage the primary sources directly. Review the above chapter titled, "Egyptian Astronomical Science before Alexander the

Great” in order to see the scholarly opinions concerning the lack of ancient Egyptian mathematical astronomy despite the great Egyptian achievements in building construction. Expertise in one discipline (building construction) does not imply expertise in another discipline (mathematical astronomy). In that above chapter it was explained that Neugebauer 1980 proposed a specific method by which the ancient Egyptians could have used the shadow cast by the capstone of a pyramid on the ground to accurately determine the day of the equinoxes when it happened, yet without mathematics.

(E) Mathematical astronomy began in Babylon roughly 750 BCE. On pp. 51-52 of Britton and Walker we note, “Around 500 BC Babylonian astronomy began a process of transformation which led to the development of radically new techniques for predicting celestial phenomena. These techniques were mathematical in nature, rational in approach, and entailed separating complex phenomena into components which could be described by mathematical functions which could then be combined to predict the phenomena in question.” In some ways the mathematical theory to predict the position of the planets is less complicated than lunar theory, and David Brown’s book concludes that during the period c. 750 BCE to c. 612 BCE the Babylonians first developed predictive planetary theory; see pages 8-9 of Brown. This mathematical astronomy was developed and recorded by the pagan priests of Babylon only in the Akkadian language, with its hundreds of symbols, at a time when this language was no longer in general use, having been supplanted by the Aramaic language. It was only after Alexander the Great defeated the Persian Empire in 331 BCE that Alexander apparently commanded that the Babylonians make their astrology-astronomy available to the Greeks for study. Not long after this, the Greeks were using Babylonian period relationships of the heavenly bodies, and also Babylonian horoscope techniques.

(F) Both Philo of Alexandria and Josephus were Jews from the first century who wrote extensively and were well educated. Neither of them implied any significant abilities in themselves or other Jews concerning mathematics or astronomy. Josephus likes to exaggerate the achievements of the Jews, and he only does this in science through bragging about Abraham’s knowledge of arithmetic and astronomy, and that Abraham taught this to the Egyptians. This claim must be historically false because at the time of Abraham neither the Egyptians nor the Assyrians (later Babylonians) possessed mathematical astronomy, although the ancient Babylonians did record observed eclipses and other heavenly phenomena, and the ancient Egyptians did record the

approximate time of certain appearances of heavenly bodies. Such recorded observations are not mathematical astronomy. Even in 2000 BCE the ancient Babylonians did perform division using the base 60 numbering system for simple accounting problems according to thousands of cuneiform tablets that have been examined by specialists in the field, but it was not until about 750 BCE that they began applying mathematics to astronomy. The Egyptians show no sign of using the base 60 numbering system before the time of Alexander the Great and the founding of the city of Alexandria in honor of him.

(G) The Rabbinic writings do not claim any advanced mathematical knowledge in their history. In the Talmud, Gamaliel II is claimed to give credit to his grandfather Gamaliel I for handing down the length of a month, yet this was derived by the Babylonian astrologer-astronomers as part of their astronomical System B in Babylon c. 300 BCE.

(H) Conclusion: It would be folly to think that ancient Israel had a calendar that was based on mathematical astronomy. The same conclusion should apply to the determination of the vernal equinox.

The vernal equinox is only known from the light of the sun or shadows from the sun. This can only occur during the daytime. Thus, while the new crescent is sighted near the time of sunset and most often during the middle of twilight, the vernal equinox must be determined during the daytime, based upon some commonly known definition.

(I) Limitations of Travel at Night. Cultural customs are established in any society by repeating a practice until it becomes an expected habit. For this to develop, the pattern must fit the varieties of circumstances. About half the months will have 30 days, so that at the end of the 29th day the pattern would be one of uncertainty for seeing the new crescent. The months do not always alternate in 29 and 30 days. In fact there can be three months in succession with the same number of days, even if the weather is clear. In the cases of cloudy weather or a borderline condition for sighting the new crescent in Jerusalem, witnesses for the sighting would have to travel from elsewhere for some hours. In ancient Israel, even in cities, travel was generally not done at night - see Judges 19:1-21 for the dangers and custom against travel by night. There is no mention in Scripture of any local police force to patrol the streets of a city at night for safety. People did not travel at night, so such a police force would be a waste of tax money. The priests who

had the responsibility to interview potential witnesses for sighting the new crescent would not want to risk harm coming to potential witnesses through their traveling at night. The priests would also desire to obtain a normal night's sleep rather than have to stay awake waiting for witnesses to arrive and be questioned in the general case when there might be a 30-day month, or the weather was bad, or it was a borderline case of difficult visibility. To satisfy the most general circumstances and establish an expected custom, the priests would be in session to question potential witnesses on the daytime that followed the possible sighting of the new crescent. This reasoning is enhanced by the use of the Hebrew *machar* (“tomorrow”) in I Sam 20:5, 18.

(J) Overcoming Darkness at Night. Inside of a home, burning wood in a fireplace would no doubt be common to provide light for eating and other matters in ancient Israel. However, for traveling purposes, potential robbers would discourage a journey by night. Furthermore, there is the potential for a destructive fire that may be caused in an accident while moving and transporting a burning object that provided light. This would also discourage a journey by night. There is every reason to expect that from the morning onward during the daytime, the priests would be in session to wait for witnesses to be heard rather than at night when the priests would want be sleeping. Beyond this, let us consider the use of fire signals on the hilltops to rapidly inform all of Israel that a new month had begun. It is difficult to imagine that people would want to walk to the tops of hills and wait there all night in the potential case that witnesses would appear at night and the two silver trumpets would be blown at night. If some such people who lit fires from hilltops were to fall asleep at night due to drowsiness, this would break the visual chain of announcement and stop the communication method from functioning. From the consideration of “tomorrow is the new moon [festivity]” in I Sam 20:5, 18 along with these various considerations of common sense, the daytime following the sighting of the new crescent would be the time for questioning witnesses rather than during the night.

(K) The Vernal Equinox would be judged in the Morning. The straight line that falls along the sun's shadow of a vertical object all of the daytime when the vernal equinox occurs is the east-west direction. In the morning of such a day, when the sun's shadow falls along this east-west line, there is no need to wait all of the daytime to see that the vernal equinox had occurred. The east-west direction is immediately sufficient to show the equinox. Once the east-west line has been marked at one location in a prior year, it is available for

future observations for the vernal equinox that only require a morning observation.

If the need to question potential witnesses for possibly having seen the new crescent occurs on a morning when the vernal equinox also needs to be judged, it would be during that same daytime of questioning witnesses concerning the new crescent that the Levitical priesthood would also examine the sign of the sun for the vernal equinox.

(L) Practical Cultural Pattern that permits Public Participation. All the questioning of witnesses, the subsequent declaration of the new moon through the blowing of the two silver trumpets, the fire signals to spread the news, and the commanded sacrifices associated with the arrival of the new moon, along with singing praises at the Temple where all the nearby people could travel to witness and participate in the festivities through singing, would have to wait until the daytime.

(M) While I do not treat the *Babylonian Talmud* as having the authority to decide biblical issues (see appendix B), it is nevertheless of interest here to note that it does support the collective reasoning above. On pages 50-51 of BT-SAN we find, “Our Rabbis taught: A leap-year is to be declared only by day, and if it has been declared by night, the declaration is invalid. The sanctification of a month is to be performed by day, and if it has been performed by night it is not valid.” This shows that even in the obvious event when everyone can see the new moon, it should not be officially declared until the following daytime. This prevents the natural tendency in people to try to outperform one another and thus risk danger by traveling at night.

(N) The obvious correlation of Nisanu 1 with the vernal equinox acknowledges this day in the Babylonian calendar, and Philo is a historical witness that corroborates the same thing. Gen 1:14 also points to this through the process of elimination of other possibilities.

Previously, Pliny the Elder from the mid-first century was quoted to show that he regards the day on which “sunrise and sunset are seen on the same line”, which means that the sun’s shadow makes a straight line, as the day of the vernal equinox. This is the true east-west line and it shows the vernal equinox. The alignment of one wall along the east-west line for each of the most prestigious pyramids of Egypt shows that ancient Egypt knew how to

determine the vernal equinox. Moses was trained in the knowledge of Egypt (Acts 7:22) and would be expected to know this. This only requires observation, no calculation, and no mathematical astronomy.

On page 158 of the book by Robert Newton there is a chart of 20 equinox observations by Hipparchus. These are dated from 162 to 128 BCE. He is considered to be the greatest of the ancient Greek mathematical astronomers. Even with his gifted application of trigonometry to attempt to use observation to calculate the time of the equinox, he is nevertheless off by an average of several hours. But ancient Israel did not use a calculation. By observation alone it is impossible to judge the hour of an equinox.

(O) The Borderline Situation. **Now consider the borderline situation of both the new crescent starting the day and the vernal equinox later on the same day in ancient Israel.** Suppose witnesses saw the new crescent at the beginning of the day, and on the next daytime they appear to testify as would be typical. Further suppose that the typical investigation of the sun's shadow line compared to an exact east-west line by the priesthood that next morning showed that the vernal equinox had arrived. Such an observation **cannot** be so precise that one can judge the hour of the equinox. Only its day is known. On the previous daytime there was no vernal equinox yet, but this next morning the vernal equinox is seen true. At the same time they also examine witnesses of the new crescent and this is determined true. They know that both occurred. This should be the first month because both arrived. The priests declare both simultaneously.

There is another example to consider as a precedent for accepting this reasoning. For 40 years in the wilderness, manna arrived in the morning each day except on the Sabbath. The arrival of manna was a morning activity just as the examination for the vernal equinox would be sometime in the morning. That the morning is the arrival time for the manna is seen in Ex 16:8, 12, 21. Now note the literal translation of Ex 16:23, "And he [Moses] said to them, 'That is what YHWH said, tomorrow is a rest, a holy Sabbath to YHWH. Bake what you will bake and boil what you will boil. And all that remains lay up for yourselves to be kept until the morning.'"

On the ordinary six days, the manna would spoil and have worms in the morning, and there would be a new supply of manna on the ground in the morning. In Ex 16:23 note the word "tomorrow", which is translated from the Hebrew word *machar*, Strong's number 4279. This word refers the next

daytime. The next daytime includes the morning, which is normally the time that any manna from the previous day would be seen spoiled and manna would be seen on the ground. Tomorrow would be an exception due to the Sabbath. Ex 16:23 states that “tomorrow is a rest, a holy Sabbath”. Although the Sabbath is from sundown to sundown, in order to emphasize that tomorrow is when they would see the exception of no spoilage in the manna and no manna on the ground, Moses said, “tomorrow is a rest, a holy Sabbath”. ***By what they would notice tomorrow, they would be able to verify that the whole day was the Sabbath.*** Similarly, by what the priests would notice on the morning of the day of the vernal equinox, they would be able to verify that the whole day was the day of the vernal equinox. The time of the equinox would have to be identified with one sundown-to-sundown day. The most obvious way to identify this is to take the day whose noontime is the closest to the time of the vernal equinox. That daytime would most be identified with the vernal equinox by visual inspection. This does agree with the conclusion from appendix C.

[49] Saadia Gaon and the Origin of the Modern Jewish Calendar

The main focus of this treatise is the biblical calendar. This calendar was maintained utilizing the performances of the Levitical priesthood from the time of Moses until the destruction of the Second Temple in 70 CE; however, the Babylonian captivity caused a temporary disruption. In an earlier chapter abundant evidence was presented from the New Testament, Tacitus, and Trogus to show that during the first century before the war broke out in 66, the Levitical priesthood controlled the Temple.

In Deut 33:10 we note the important role allotted to some of those in the tribe of Levi, “They shall teach Jacob Your judgments and Israel Your law. They shall put incense before You and a whole burnt sacrifice on Your altar.” After the destruction of the Temple, as far as history provides evidence, the priesthood ceased to function and its ability to provide guidance to the application of the biblical calendar ceased. Thus Deut 33:10 was no longer applied after the destruction of the Temple in 70. History records changes in the calendar used by the Jews long after 70. With these changes, it seems natural to refer to the calendar used by the Jews as the Jewish calendar rather than the biblical calendar.

With the change in Jewish leadership after 70, my method of presenting evidence for the distant post-70 time frame is now altered for this unique

chapter that deals with the Jewish calendar. My approach here changes away from an analysis based upon primary sources (in translation) as far as is possible, to a very sketchy account with reliance on secondary sources. This is only a temporary departure in method. This chapter is in part a continuation of the theme that the biblical calendar did not employ mathematical astronomy. Saadia Gaon represents a challenge to that claim, and that is a reason for dealing with this matter.

Saadia Gaon (882-942) wrote the oldest known dictionary of biblical Hebrew and the oldest known grammar book of biblical Hebrew. He translated most if not all of the Tanak (the Hebrew Bible) into Arabic. He is considered one of the greatest Jewish philosophers during the post-Talmudic period. He was given the title Gaon because he became the head of the Jewish academy in the city of Sura (in modern Iraq). He championed Rabbinic Judaism against his Jewish sectarian opponents and was a fierce debater. In the history of the Karaite movement in Judaism he is considered their most famous enemy because he engaged in heated arguments with the Karaites and he sought to dissuade Jews from joining the ranks of the Karaites. On page 86 of the chapter by Alexander Marx we read, “Numerous [Jewish] sects arose in the East [Iraq/Iran], and while most of them were of ephemeral character, they inaugurated a movement which finally led to the rise of Karaism, a sect which was founded in the second half of the eighth century and is still in existence.” Saadia was born in 882, about 100 years after the Karaite movement began.

Saadia’s most frequent topic of debate with the Karaites is that of the religious calendar. Saadia championed the modern calculated calendar. The Karaites did not follow the calculated calendar of the Jews and sought to use phenomena that were observable to determine the beginning of each month and to determine which month is the first. One category of Saadia’s works is known as polemical works. These are writings whose primary purpose was to defeat the positions of his enemies before some audience. If the audience is lacking in knowledge, a debater may be able to make invalid claims and still win the hearts of the audience. When evaluating any polemical work, the reader must be on guard to determine whether the writer is being objective and fair with history and all available evidence. Evidence will be presented to show that Saadia was neither objective nor fair with history.

On page 159, Samuel Poznanski 1898 wrote, “The Sectaries, especially the Karaites, by their attacks on the [calculated] Calendar, misled so illustrious a

genius as Saadiah into anachronisms, logical fallacies, and egregious blunders. The Gaon claims that the [calculated] Calendar is of Sinaitic origin [given to Moses at Mt. Sinai], and that its rules [concerning postponements, mathematics, etc.] existed in the days of Moses. It was easy for his [Karaites] opponent to demonstrate the utter absurdity of this contention. And Hai Gaon had to admit that Saadiah did not really intend the assertion to be taken seriously. His [Saadia Gaon's] object was to snatch a momentary triumph in the verbal combat.”

On page 393 Solomon Zeitlin wrote, “Already Hai Gaon had noticed that Saadia Gaon’s arguments were only for the purpose of dismissing the [Karaites] heretic. Isaac ben Baruch, who quoted Saadia’s contentions at length, refuted him on every point and showed from the Talmud the fallacy of Saadia’s ideas. Maimonides was even stronger in his utterance against Saadia. Maimonides said that he wondered how a man could say that the Jewish religion was not [originally] based on the observation of the moon but on calculation only; he continued that Saadia, regardless of true or false statements, was only interested in refuting his opponent. Abraham Ibn Ezra also maintained that what the Gaon (Saadia) said about the Jews [originally] intercalating the months according to calculation was not true.” On pages 393-394 Zeitlin continued, “Indeed everyone who is acquainted with the Talmud knows that in the time of the Tannaim [Talmudic sages who were alive from c. 1 through c. 250] the Jews did not have a fixed [calculated] calendar: Passover [Nisan 15] did fall on Fridays; *Rosh ha-Shanah* [first day of the seventh month] fell on Sundays; the Day of Atonement fell on Fridays and on Sundays.” On page 394 Zeitlin wrote, “However, Saadia Gaon believed that *the end justifies the means*. He had a righteous cause and he fought with all the means he thought necessary.”

On page 37 Salo Baron wrote, “However, in the rage of controversy he [Saadia] did not hesitate to reinterpret history in a way which, although violating historic facts, would serve his major historic purpose of combating heresy.”

From the above quotations we note that in Saadia Gaon’s debates with certain Karaites in which a Jewish audience is assumed to be present, he had claimed that the rules of the calculated Jewish calendar were given to Moses at Mt. Sinai, but leading Jewish sages shortly after him recognized that these claims were absurd because there was nothing in history to back up such claims and the Talmud contradicted such claims in several ways. This

implies that Saadia did not think his Jewish audience would possess any knowledge of the origin of the calculated calendar that they were following. Thus the origin of the calculated calendar must already have been somewhat of a historical secret among the laity of Judaism shortly after 900 when these debates occurred. It is at least clear that the rabbis in the Rabbinic synagogues did not actively teach the history of the calculated calendar because if they did, the Jewish audience would know its history and the famous Saadia would be a laughing stock among common Jews.

In a previous chapter it was explained that the average length of the month as mathematically expressed in the modern calculated Jewish calendar was stated in the *Babylonian Talmud* (published c. 600), and this exact value was first determined by the ancient Babylonians about 330 to 300 BCE. It does not make sense to imagine that this value was given to Moses over 1000 before this Babylonian invention, as Saadia Gaon would have his Jewish audience believe. This is the only mathematical parameter within the rules of the calculated calendar that appears in the Talmud, but there are several other mathematical parameters that comprise the calculated calendar. The Talmud itself does not claim that this value is used or will be used in the Jewish calendar. The Talmud never claims that the Jewish calendar is to be calculated.

On page 48 of Wiesenberg we note the following concerning the Patriarch Hillel II who lived in Palestine and who is mentioned in several places in the *Babylonian Talmud*, “According to a tradition quoted in the name of Hai Gaon (d. 1038), the present Jewish calendar was introduced by the patriarch Hillel II in 670 Era of the Seleucids – 4119 Era of the Creation = 358/59 C.E. (500 C.E., claimed to derive from another version, seems to rest on a mistake).” This quotation, put in simple terms, says that the claim that the modern calculated Jewish calendar originated with Hillel II in 358/359 is based upon one writing by Hai Gaon (died 1038, Gaon of the academy of Pumbedita). Nothing known before Hai Gaon alleges this.

On page 158, Samuel Poznanski 1898 wrote, “If [shortly after 900] it had been generally believed that the [calculated] Calendar was fixed by Hillel II, it would have been not merely idle and futile, but probably foolish on the part of Ben Meir [a major Jewish leader and scholar in Palestine], who, rightly or wrongly, styled himself a descendant of the Patriarch [Hillel II], to revolt against the Calendar [with regard to only one aspect of one of its postponement rules], of which his own ancestor [Hillel II] had been the

author, and in regard to which Palestine [the dwelling place of Hillel II] had laid down the law for all Israel.” Here Poznanski presents a strong argument that Ben Meir did not believe that Hillel II established the rules of the calculated calendar!! This is an argument that Hillel II did not establish the calculated calendar.

A second argument that Hillel II did not establish the calculated calendar is that the *Babylonian Talmud*, published c. 600, states much about Hillel II, but nothing about Hillel II in relation to the calendar. While this is an argument from silence, and is therefore subject to criticism on that ground, matters associated with the calendar are often mentioned in the Talmud, so it would be surprising if such an important matter were totally neglected in the Talmud. The Talmud mentions nothing about there being an authoritative calculated Jewish calendar.

A third reason that Hillel II did not establish the calculated calendar is presented on page 118 of Poznanski 1911. There he points out that in the years 506 and 776 there are dates in the Jewish calendar that contradict the modern calculated calendar. In fact this implies that the modern calculated calendar was established in its near current form on or after 776.

On page 254 of Stemberger 2000 he translates the following from a work of Maimonides (1135-1204), “And when did Israel begin to calculate according to this calculation [the one used in the modern calendar]? Since the end of the scholars of the Gemara, in the time when Israel was laid waste and no fixed court remained there.” This is vaguely sometime after the Talmud was completed c. 600. Stemberger wrote on page 255, “However, if he [Maimonides] had been aware of the tradition about a fixed calendar introduced by Hillel II, he would certainly have expressed himself with greater precision.” Maimonides wrote a complete exposition on the calculated calendar including explanatory remarks, so he would have made an effort to be precise if he had knowledge. This is a fourth reason that Hillel II did not establish the calculated calendar.

On page 118 Poznanski wrote, “In point of fact, everything goes to indicate that the calendar, like all other productions of the kind, passed through a developing series of forms, and that it assumed its final shape in the schools of the official representatives of Judaism (called Geonim) in Babylonia.” There were two leading Jewish academies in Babylonia, one in Sura and the other in Pumbedita. The head of each academy was given the title Gaon.

Qualifications of a Gaon were to be both a significant scholar and a respected leader within Judaism. In a sense it was a political feat to become a Gaon, although Jews did not have their own country. The two leading Babylonian academies were held in very high esteem by the rabbis in that era. Important rabbis were often trained there.

In the biographical sketch of the life of Hayyim J. Bornstein (1845-1928) by Abraham Fraenkel (see the reference under Fraenkel), on page 1252 we note, “Bornstein’s knowledge of chronology, history, and mathematics enabled him to open new avenues in the study of the development of the Jewish calendar. He based his theories on several documents in the Cairo *Genizah*, the importance of which he was the first to recognize. Bornstein advanced the novel claim that the details of the Jewish calendar, with its small cycle of 19 lunar years and its method of reckoning the conjunction of the planets [“sun and moon” should replace the word *planets*], had not been calculated and accepted until sometime between the mid-eighth and mid-ninth century CE, and not in the period of the *amoraim* [sages of the Talmud after 250] under Hillel II as had been generally believed – much less in the first century CE, as claimed by the German chronologist F. K. Ginzel.”

There is some speculation that perhaps only the fixing of the 19-year cycle was achieved by Hillel II. If this were true, the question remains as to why the Talmud and other authorities are completely silent on such a weighty matter.

My conclusion is that the origin of the modern calculated Jewish calendar was between c. 750 and c. 850, and it was agreed upon by the Gaonim (heads) of the Jewish academies at Sura and Pumbedita in what is now modern Iraq. These academies were the leading schools that produced Rabbis and Jewish scholars. The Karaite movement began during the early part of this period. There was no Sanhedrin during this part of Jewish history.

[50] The International Date Line, the Sabbath, and the New Moon

Beginning with this chapter, the subject of how to determine the first day of the month for the various parts of the world is treated. In order to avoid forcing the curious reader to wander ahead to discover the conclusion, I will give a brief summary of the next group of chapters here. Summary for the next group of chapters: The sighting of the new crescent for the purpose of

defining the start of a new month should be from within the biblical boundaries of Israel, and sundown at the International Date Line should begin each first day of the month before anyone in Israel would be able to see it. This implies that on some occasions people to the east of Israel would begin a new month that later was determined to be one day prior to the new month. This would primarily matter on the first day of the seventh month, when they might keep two successive days as was sometimes done in ancient Israel.

Many people do not realize that there is a need for an International Date Line (IDL), and they need to be convinced that there is such a need. During the 19th century the international community recognized the need for an IDL, and they established it in the Pacific Ocean by agreement of some of the most influential nations. Perhaps the most obvious need was seen in simply recording the date and time of events in various parts of the world. If it is noon on Saturday in England, what time and day is it in Australia? The answer partially depends upon where the IDL is placed. If the IDL is placed between Australia and Japan, you get one answer. If the IDL is placed between Australia and Hawaii, you get another answer. The IDL also affects the day for keeping the Sabbath in some parts of the world, as we shall explore next.

If a group of people in Israel performed the following experiment, consider the outcome. Let half of them travel east 1000 miles during the course of six days and rest on the seventh, and the other half travel west 1000 miles during the course of six days and rest on the seventh. Since there are about 24,000 miles around the earth at the latitude of Israel, each 1000 miles represents one hour of time. At the end of the six days in the experiment, the group that traveled east will start their Sabbath two hours earlier than the group that traveled west, because they are 2000 miles further east. If this is continued for another week in the same direction, the group that traveled east will be start their Sabbath four hours earlier. If this experiment is continued for 12 weeks and boats are available for water travel, the two groups will meet in the Pacific Ocean. The group that traveled east will start their Sabbath 24 hours sooner than the group that traveled west, so that while neither group lost track of the days and both groups had sincere intentions, if they got together on the same boat there would be confusion on which day to begin the Sabbath.

If ships had carried colonists from countries that had previously adopted the seven day weekly cycle to North America, and if they had originally traveled east across the Pacific Ocean instead of west across the Atlantic Ocean, then they would have given the name Sunday in North America to the day we now call Saturday, and their week would be shifted one day.

These examples show the absolute need for an IDL to officially start the day for the purpose of keeping the Sabbath and avoiding confusion on the day it begins. If an IDL were proposed that crossed land where people lived, then neighbors on one side of the line would keep a different day as the Sabbath compared to others across the line. This destroys spiritual unity and is a source of confusion.

Jewish scholars since Talmudic times have recognized that a spherical earth requires an IDL for the purpose of keeping the Sabbath. Pages xxiii-xxiv of Sternberg give his translation of a passage in the *Babylonian Talmud* (RH 20b) that relates to the IDL. Page xxv gives the opinion of Chazon Ish that this implies that the IDL occurs at the end of the Asian continental landmass. On page 343 of the article by Jakobovitz, he states, “The international dateline has also been endorsed by the rabbinate in Jerusalem in its reply of 1942 to the inquiry received from the refugees in Japan.” This means that society's IDL has been accepted by Jewish authorities as the IDL for the Sabbath, thus overruling the *Babylonian Talmud*, a very rare event. It is interesting to note that modern Jews desired to have a ruling come from Jewish authorities in Jerusalem, and this occurred in 1942, before Israel was recognized as a nation in the geopolitical sense.

Scientists today believe that the land surface of the earth was once together as one mass of land with one very large ocean around it. This is evident from examining the globe's landmasses and noticing how they fit together, such as mentally pushing North America and South America into Europe and Africa. This is also noted by matching geological rock formations and plant species with corresponding parts of matching areas across the Atlantic Ocean. At the time when the world only had one land mass it was only sensible that the IDL run through the one ocean to avoid neighbors keeping the Sabbath on two different dates, thus avoiding confusion. As the one land mass separated, the IDL should not change. This would put the IDL in the middle of the Pacific Ocean as men have decided to do in the nineteenth century. But the creation shows the mind of the Creator in establishing the IDL at that place to avoid confusion on when to start the Sabbath day. The biblical

principle is found in Ps 133:1, the pleasantness of unity that comes by mental peace in practical agreement that agrees with the Tanak.

If it is confusing, annoying, or disruptive to run some line along a landmass and imagine that people on one side of the line keep the Sabbath on one day and people on the other side of the line keep the Sabbath on the next day, why shouldn't it also be equally confusing when the first day of a biblical month is considered in the same way? In my mind it would be confusing to begin a month with a disruptive line on a landmass that separated the month start on one side of the line from the month start on the other side of the line. This is especially true if the line were to change from month to month, and it would even be more discomforting if the line was wide and fuzzy with pockets of exception in various places due to humidity, height above sea level, and bad weather. Considering the philosophical principle of avoiding confusion, it is natural to extend this from the Sabbath to the start of a month using the IDL.

The Sabbath cycle is much simpler than the monthly cycle because the former is always a seven day cycle, while the latter is a cycle of 29 or 30 days, which does not necessarily alternate between 29 and 30 days. There are some natural reasons for desiring to take simplifying concepts that apply to the Sabbath, such as the IDL, and also transfer them to the start of each month. Lev 23 discusses all of the days of holy convocation. Relating to all the festivals as well as to the seventh day Sabbath, the words *holy convocation(s)* occur in verses 2, 3, and 4 of Lev 23. Lumping the seventh day Sabbath together with the festivals in the same chapter under the larger umbrella of *holy convocations* does seem to be a reason to transfer simplifying concepts that apply to the Sabbath to the festivals as well.

It must be admitted that the confusion primarily stems from the fact that we have modern methods of communication today. Not only do we have the Internet and telephones, but we also have automobiles and jet planes, so that we may travel for attendance on the Sabbath and on the festivals. If modern technology was completely removed and each family was an island unto itself without contemplation of travel, the confusion would disappear. But no one expects society to give up modern technology for travel and communication, so there is a need to face and solve the resulting issues.

[51] How the MCJC achieves Spiritual Unity using the IDL

From a strictly mathematical viewpoint, the IDL is not part of the computation of the day of each month of each year that is performed according to the rules of the MCJC. But in a practical sense the Jewish use of the MCJC includes the Jewish adoption of the IDL, so that Jews in the modern world would have a method to determine when to keep the festivals in their area of the world. From this *applied* mainstream Jewish viewpoint, the MCJC is used with the IDL. Since spiritual unity on the holy convocations is a philosophical goal, let us consider for a moment how the MCJC achieves spiritual unity. First it determines a specific date for the start of each numbered month. Once the beginning of the month is established, mainstream Judaism respects the IDL, so that the first place for the start of a new day (including the Sabbath, a festival day, or a new moon day) is at this IDL at sundown. Then sundown flows to the west on the earth, and each place begins the new day as sundown comes to that place. This achieves a simplicity and spiritual unity that is in harmony with Sabbath observance around the world by multitudes of groups that are motivated to keep the Sabbath. Moreover, this method extends to the festivals and the days of the new moon. The big problem with the MCJC is that the computation of the first day of each month is incorrect about 77.5 percent of the time within the borders of Israel (see appendix F), and the determination of the month number is off by one month in some years. One exceptional aspect was overlooked in this explanation. When people on the earth are near the North Pole or the South Pole, sundown as well as the ability to see the moon are greatly distorted, especially during certain long periods of the year. In such cases, people typically resort to choosing 6:00 pm on modern clocks as the time to begin each day.

The Jewish approved IDL-applied aspect with the MCJC has the advantages of (1) Attaining spiritual unity; (2) Respecting the universal method for observing the Sabbath; and (3) Being in agreement with the time that ancient Israel kept the Sabbath. In a certain sense the IDL is not arbitrary because some place for an International Date Line is a necessity and the Pacific Ocean is where the one major body of water on the earth was originally placed. The only aspect of the IDL that may be considered arbitrary is the specific way that it wiggles around certain groups of islands in the Pacific Ocean. If a correction would be made to the MCJC to arrive at the first day of each numbered month that was much more in harmony with the calendar of ancient Israel, then the philosophical goals originally expounded would be met.

[52] Avoiding Confusion and Disunity (Ps 133:1)

If there is a significant density of people around the earth desiring to keep the festivals, any boundary that began the new month that cuts across a landmass would cause confusion among the people. Even though people may be organizationally independent, that should not hinder friendships and occasional visits away from one's normal attendance site during biblical festival days whose dates depend upon determining the first day of the month. If there are different dates by different people who come together to keep the festivals, there will be conflicts and disunity. All biblical contexts that mention the festivals seem to take it for granted that there are no conflicts and that there is just one day that is holy for each specific commanded assembly. The only exception might be the start of the seventh month where ancient Israel would occasionally keep two successive days unless the first day of the two was confirmed to be the first day of the month.

Organizational independence need not require confusion on the determination of the start of the first and seventh months. In order to avoid confusion and disunity, the first day of each month should respect the IDL rather than cause it to change every month with a new curved line with exception regions. Such a proposed curved line of first visibility is in reality a fiction because it depends on the observer's altitude above sea level, humidity (high humidity hinders visibility and low humidity favors it), air pollution, rain, etc. The approximate angle of such a curved line will change from month to month because the moon's path changes somewhat with respect to the earth's axis (the orbit of the moon does not lie in the plane of the earth's orbit, and in fact this approximately repeatable pattern follows the Saros eclipse cycle of 18.03 years). Any such curved line is not a sharp narrow line because it will depend on the eyesight of individual people who are striving to see it. There will be regions where some percentage of the people will see it and others will not. Such a curved line will not be one neat pattern because humidity variations will cause it to wiggle in significant ways, and oftentimes, altitudes that are at least above 4000 feet above sea level will produce geographical areas of visibility that are isolated from other larger regions of visibility. Regions of high humidity will sometimes cause local regions of non-visibility in the midst of much larger regions of visibility. When people do not see the crescent at their dwelling place and others some distance off do see it, the question remains concerning the conditions that would cause the individual to accept the sighting of others. It may matter to some people if others that attend the same congregation did

see it, although such people may have traveled quite a distance to get to the meeting place. If two different organizations that had overlapping geographical areas of attendees came to different conclusions based upon who saw the new crescent within each congregation, wouldn't that be a cause of confusion if they wanted to meet together for a festival?

For the purpose of establishing the beginning of the month, using so called "local visibility" of the new crescent from outside Israel leads to arbitrary decisions and confusion. The first aspect of arbitrary decisions and confusion is defining local visibility. Suppose the new crescent can be seen from Fort Worth, but cannot be seen from Dallas, which is 30 miles to the east. Should people in Dallas accept the testimony of people in Fort Worth for visibility of the new crescent to start a month? What distance should be the limit for accepting someone else's testimony? Suppose the only places in the United States from which people can see the new crescent are over 8000 feet above sea level in the Rocky Mountains. Should people elsewhere in the United States accept their testimony? If no one in the United States can see the new crescent, but some people in Baja, Mexico can see it, should their testimony be accepted in the United States? In order for local visibility of the new crescent to be applied in today's world, it must first be defined so that there is a principle to apply. In order to be practical it should be defined in some manner so that any proposed definition may be applied in different areas of the world, not merely on one small island.

If someone proposes that the first place on the earth that any two witnesses see the new crescent starts the new month for the whole world, there are still problems. The most significant philosophical problem is that whenever this place is to the west of Israel's time for sighting the new crescent and still before the IDL, Israel would be made to keep any festivals of that month one day sooner than Israel would keep it if the Levitical priesthood existed and functioned exclusively within the boundaries to which they were anciently confined among the original tribes. Another problem with this proposal is that people on one side of the sundown line at that time will not be in the same day as those on the other side of the sundown line. Thus people who are geographically very close will potentially be keeping the festivals one day apart, so that confusion and disunity will still exist by this method. Another potential problem is that if some two people in one very remote area of the world post a message on some web site that they saw the new crescent, how would people know whether they were not pranksters? In Israel today, those who are witnesses to the sighting of the new crescent are

known by those who post the sightings, so the problem of pranksters is virtually eliminated. To some people, another problem with this proposal is that one segment of the world that did not see the crescent would be deprived of seeing the new crescent on the day that they would be expected to begin the month; this latter reason is the cause for those specific people today to be zealous supporters of their concept of “local visibility”, although there is a problem in defining local visibility for various circumstances without inventing arbitrary rules.

If someone proposes that some mathematical calculation substitute for the actual sighting of the new crescent, there would be the objection that this would not always agree with actual sighting of the new crescent from Israel, which was anciently used. A mathematical calculation would only be attractive if modern methods of communication broke down, and this was attractive before timely web site postings of sightings of the new crescent were available.

[53] Dwelling in Spiritual Unity Through the Declaration of the Priesthood

The earlier chapter titled “Authority of the Levitical Priesthood from the Tanak” explained how Ps 133 shows the spiritual unity on the days of holy convocation that is attained through the authority of that priesthood.

Once the ability for widespread communication exists to make spiritual unity possible, biblical principles that promote unity in recognizing the days of holy convocation should be promoted. If people in their own areas around the world attempt to determine the start of a month by individually sighting the new crescent, it will most certainly lead some people who are relatively close to one another to have conflicting days for the appointed-times.

We do not have any Levitical priesthood today, but if we are given the same information that they could have through postings on web sites, then we could presumably arrive at the same decision they would, thus simulating the priesthood..

[54] Does Deut 16:1 Command Everyone to Look for the New-Moon?

Deut 16:1 has been used by various peoples to promote highly specific viewpoints regarding the calendar, some of these viewpoints conflicting with the others, but all from the same verse. I have about a one inch thick folder

with photocopies from a wide variety of sources just on this verse, and I have looked this up in about 40 different translations and many commentaries.

One basic principle of properly understanding the Bible is that a technical expression should have the same meaning wherever it is used. This is especially true if the writer is the same in all instances of its use. All of the six places that *chodesh ha aviv* occurs were written by Moses, and two of these places are in Deut 16:1. This technical expression *chodesh ha aviv* should mean the same thing in both places of its use in Deut 16:1.

In the second instance of its use in Deut 16:1, *chodesh ha aviv* refers to the time that the Israelites were freed from Egypt in the middle of the first month, not at the start of the month. Consequently, although the word *chodesh* in the general situation can mean either new-moon or month, in the specific expression *chodesh ha aviv* it needs to have one fixed meaning, and from its second use in Deut 16:1, its meaning must be “month”, not “new-moon”.

From the above reasoning, Deut 16:1 should *not* mean approximately “Go out looking [in the sky] for the new crescent of *aviv*”. Otherwise the second half of this same verse would mean that in the new crescent of *aviv* the Israelites achieved freedom from slavery in Egypt, and this is not true according to Num 33:3. Those who interpret Deut 16:1 in the sense of a commandment to watch for the new crescent would use the examples of I Sam 19:11; Ps 59:1; 130:6; Eccl 11:4 where the Hebrew word *shamar*, Strong's number 8104, could mean to watch with one's eyes.

One conclusion is that Deut 16:1 is not a specific commandment for everyone to go out looking for the new-moon that begins the first month.

[55] Ancient Israel did not Practice Local Visibility

Knowing that two priests in ancient Israel were commanded to blow two silver trumpets on the first day of each month to officially declare the beginning of the month (Num 10: 1-2, 8-10), when the time arrived at which the Israelites were to keep the three annual festivals in one place (Deut 16: 5-6, 10-11, 13-16; 12:5-21), Israel did not practice "local" visibility to begin the month and determine the festival dates since, when gathered together at the festivals they were all together in one place with one high priest. Thus

Israel was united in keeping the festivals on the same days and united on beginning the months on the same days, which is against local visibility in different parts of Israel.

[56] Confusion of a Difference of a Whole Month in the Calendar

In some years local visibility (assuming this may be defined in a satisfactory way) could make the difference between a month being considered as the 13th month for part of the earth and as the first month for the remainder of the earth. This would cause the festivals to be kept one month apart for different parts of the earth in such a year, resulting in greater confusion. The year 2007 provides an example.

During the twilight that ends March 20, 2007 the new crescent was seen by multiple people in Israel. Several hours later at about 2:07 local time in Israel (00:07 in Greenwich) on March 21, the vernal equinox is predicted by BRESIM software for modern astronomy. In the previous chapter titled “Declaration of the Vernal Equinox in Ancient Israel” it was explained that in Israel, March 21, beginning the previous evening, would be the first day of the first month. In parts of the United States the new crescent was first seen during the twilight that ends March 20, and the moment of the vernal equinox occurred in the western U.S. shortly before sundown, not soon enough to be counted for March 20 based on observation from the U.S. Therefore, using some concept of local visibility (assuming it may be satisfactorily defined without confusion), March 20 in the U.S. would be the first day of the 13th month. This would result in certain parts of the earth celebrating all festivals one month later than other parts of the earth. This type of confusion argues against some concept of local visibility.

[57] The Role of the Land of Israel

The role of the land of Israel must be appreciated in the plan of Scripture. This land is called the inheritance of Israel (Num 26:51-56; Deut 4:21; 31:7). Entering the land of Israel is called a rest (Deut 12:9; 25:19; Josh 22:4; Ps 95:11). Among the adults in Israel who left Egypt, only Joshua and Caleb were allowed to receive the inheritance of the land by faith (Num 14:6-9, 24, 30, 38), which is a type of the faith of the saints that is needed to receive eternal life (Ps 37:9, 34). The land promise to Abraham, Isaac, and Jacob (Gen 12:1; 15:7, 18; 17:8; 26:1-3; 28:10-15; 35:12; Deut 34:4) was a theme for over 430 years (Ex 12:41) before the beginning of its literal fulfillment.

A resident alien (Hebrew *ger*) could become a full citizen in Israel through fleshy circumcision, which made him become like a native of the land (Ex 12:48). The land was to have a Sabbath rest (Lev 25). Finally, according to Deut 11:11-12, the “eyes of YHWH” are always upon this specific land. From time to time through the history of Israel in this land, the priesthood moved from place to place. The first Passover in the land was kept at Gilgal by all of Israel (Josh 5:10). Soon Shiloh became the political center (Josh 18; I Sam 1:3, 24). At first King David reigned from Hebron (II Sam 2:11), but afterward he reigned from Jerusalem (II Sam 5:5). For approximately the first 400 years of Israel's history in the land, the political headquarters was not Jerusalem, but the calendar continued regardless of the political center.

There is a biblical principle that in the mouth of two or three witnesses a matter shall be established (Deut 17:6; 19:15; Mat 18:16). Does it make sense that if the weather is rainy at wherever the political center of Israel happens to be, no citizens of Israel from elsewhere in Israel may appear as witnesses before the priests for having observed the new crescent? No.

[58] The Boundary of Israel

Since Israel is prominent in the “eyes of YHWH” according to Deut 11:11-12, the subject of its boundaries is now discussed.

In a covenant with Abraham, the southwest border of Israel is stated in Gen 15:18. There, for the southwest, it states the River of Egypt. J. H. Hertz comments on this verse that the River of Egypt is “the Wady-el-Arish, which is the boundary between Egypt and Palestine”. A map on page 71 of the atlas by J. Carl Laney shows the Wadi el-Arish at the place where other maps show the Wadi of Egypt or Brook of Egypt that starts at the Mediterranean Sea and goes toward Eilat (also spelled Elath or Eloth), but appears to stop in the desert before reaching Eilat.

The Tanakh-JPS translation of I Ki 9:26 states, “King Solomon also built a fleet of ships at Ezion-geber, which is near Eloth on the shore of the Sea of Reeds [Red Sea which goes into the Gulf of Aqaba] in the land of Edom”. Ex 23:31 states, “I will set your borders from the Sea of Reeds [Red Sea at Elath] to the Sea of Philistia [Mediterranean Sea], and ...”. Map 4 in the NIV shows the region labeled Edom and continuing down through Elath (using a color marking and an identifying legend) to be part of the Empire of David and Solomon. Because the southern desert down toward Elath was not

populated due to lack of rain and opportunity for crops, most maps ignore it and even cut off the map before it reaches Elath. The use of Beersheba in II Sam 24:2 in the expression “from Dan to Beersheba” indicates that Beersheba was the most southern populated city, not that the territory of the kingdom ended there.

Some years ago when Israel agreed to give back the Sinai region to Egypt for a peace treaty, I was very surprised until I investigated and learned that according to Jewish scholars (as summarized in Gen 15:18; Ex 23:31; I Ki 9:26, mentioned above), Israel was only giving Egypt what Israel considered to be reaching up to the boundary specified in Scripture. The modern southwest boundary of Israel is believed to be the boundary stated or directly implied by the three verses.

[59] The law will go forth from Zion - Isaiah 2:3 and Micah 4:2

Scripture does not give an explicit comprehensive discussion of the biblical calendar as it applies to the entire world with modern technology, but those who recognize the need to observe the festivals desire to understand when to keep the festivals. In an effort to understand the application of the biblical calendar, certain principles of application are sought. Attention is now turned to one biblical principle that has been used by various sources that discuss the biblical calendar, including the *Jerusalem Talmud* and the *Babylonian Talmud*.

Isa 2:3 and Micah 4:2 say, “... the law will go forth from Zion and the word of YHWH from Jerusalem.” This is a prophecy of the future when the Messiah will reign. It relates to the seat of government where decisions are made.

A variety of different viewpoints are possible concerning these Scriptures depending on one's background and proclivity. The view of the *Jerusalem Talmud* and the *Babylonian Talmud* will be presented as well as some thinking from some Messianic oriented individuals. This is a unique chapter in its blend of divergencies and contrasts.

John 4:21 says, “Woman, believe Me, the hour is coming when you will neither on this mountain, nor in Jerusalem, worship the Father.” In a very narrow sense the “you” in this verse refers to the woman, but the nature of the statement in its context implies that it refers to people in general. More

specifically the context is worship, and this brings to mind such Scriptures as Jer 7:1-2 and Zech 14:16-17, which relate to holy convocations on the Sabbath and the festivals. John 4:21 is a prophecy (not a commandment) that was fulfilled when Jerusalem was destroyed by the Romans in 70 CE, and was more strictly fulfilled in 135 CE when the Jewish rebellion under Bar Kochba was defeated by the Romans. Nevertheless, eventually Jews returned to Jerusalem. Since Israel became an independent nation in 1948, even some Sabbath keeping Christians have settled in Jerusalem and Israel. Thus the period of the relevance of this prophecy in John 4:21 has been fading. Historically, when the prophecy of John 4:21 was in fulfillment, the law did not go forth from Zion (Isa 2:3 and Micah 4:2), because Zion was not the seat of priestly or theocratic government.

Interpretation of texts is sometimes tricky and subjective. Two examples are now presented.

Mat 22:40, “On these two commandments hang all the Law and the Prophets.”

In other words, all of the teaching of the Hebrew Scriptures contains laws and principles that grow out from the two general commandments found in Deut 6:5 and Lev 19:18. A narrow contextual view is not taken of these two verses of the Hebrew Scriptures in Mat 22:40.

I Cor 9:9-10, “For it is written in the law of Moses [Deut 25:4], ‘You shall not muzzle an ox while it treads out the grain.’ Is it oxen the Almighty is concerned about? Or does He say it altogether for our sakes? For our sakes, no doubt, this is written, that he who plows should plow in hope, and he who threshes in hope should be partaker of this hope.”

In other words, Paul is not taking a narrow contextual view of Deut 25:4, but is broadly applying it beyond the animal realm to those who devote full-time energies to preaching and teaching.

These examples of the use of quotations of the Tanak in the New Testament show that one is not required to use a narrow contextual interpretation if none is available. If there is no Scripture that applies like a hand in a glove in its natural context, then one has the liberty of generalizing and broadening the context of the Scripture in order to find guidance in an attempt to avoid arbitrary subjective decisions.

The explanation above provides one reason that Isa 2:3 and Micah 4:2 may be used with regard to the biblical calendar before the arrival of Messianic rule from Jerusalem. However there is yet another reason that should be given some thought. Both the *Jerusalem Talmud* (c. 400 CE) and the *Babylonian Talmud* (c. 600 CE) give parallel yet slightly different accounts of the same incident involving the Jewish sage Hananiah. Jacob Neusner dates this event c. 145 CE (see page 120 within pages 113-121 of the original 1965 discourse by Neusner, and page 129 within pages 122-130 of the 1984 reprint). The account of this event in both Talmuds uses Isa 2:3 and Micah 4:2 to settle this calendric dispute c. 145. They use these verses as the single greatest factor, as a general principle, as a biblical weapon to decide the issue.

Since I will shortly discuss this incident involving Hananiah occurring in both Talmuds, which quote from Isa 2:3 and Micah 4:2, the reader may well ask for some justification for quoting from the Talmud. Understand that my goal here is to explore a **method of reasoning** from these verses, not whether the incident from the Talmud is historically accurate. The reader must decide whether the method of reasoning is sensible. How do I view the Talmuds? This is explained in appendix B.

Rabbinic writings say absolutely nothing about any Jewish sage before 70 having any abilities in mathematical astronomy, and this even includes Daniel and Abraham. When Gamaliel II is said to have mentioned the length of a synodic month in the *Babylonian Talmud*, this exact time period including the fraction of a second comes from Babylonian astronomer-astrologers whose calculation originated c. 330 to 300 BCE. The Talmud does not claim that Gamaliel II himself directly possessed such mathematical and astronomical skills, although some later Orthodox Jewish commentators interpret a text in the *Mishnah* so as to infer that Gamaliel II possessed such skills. The *Babylonian Talmud* does ascribe much mathematical skill to Mar Samuel (c. 250 CE), who is said to have had the ability to compute a calendar for many years into the future. Commentators on this matter claim that Mar Samuel's proposed calendar was not accepted.

I believe that the Talmuds contain some remnants of historical value from the first century, but with some fabricated embellishments. Some of it represents false tradition and some true tradition. In some cases Josephus and the Talmud do agree on legal details not directly discussed in Scripture,

but this may reflect only the Pharisaical position rather than practiced reality. In general, I do not accept Talmudic teachings as binding.

My primary reasons for introducing the account of Hananiah (c. 145) are to provide the reader with additional thoughts regarding the use of Isa 2:3 and Micah 4:2, as well as to provide the Orthodox Jewish viewpoint on how these verses may be applied to the calendar. With regard to the sighting of the new crescent in order to establish the day of the new moon, the Karaites in Israel today only accept witnesses who sight the new moon from within Israel. There are significant matters concerning which I disagree with the Karaites from Israel.

An interesting source and commentary on the Hananiah event is pages 106-111 of the book by Gafni. Hananiah was a Jewish sage (scholar) who was a native of Palestine and educated there. A rough guess of the year of his birth is 100. Due to unfavorable conditions for the Jews after the Bar Kochba revolt against the Romans began in 132, Hananiah emigrated to Babylonia where he continued to gain respect as a sage. The setting of the event is with Hananiah in Babylonia. On page 108 Gafni has a translation of the account from the *Jerusalem Talmud* (Sanhedrin 1.19a), and he provides useful comments of his own in ordinary parentheses as follows. “Hananiah the nephew of R. Joshua intercalated (i. e. proclaimed leap-years) abroad. Rabbi (here the term means the Patriarch, most probably Rabban Shimon b. Gamaliel [Simon II], circa 150 CE) sent him three letters with R. Isaac and R. Nathan. In one he wrote: ‘To his holiness Hananiah’, in one he wrote: ‘The lambs you left behind [in Palestine] have become rams [scholars]’, and in one he wrote: ‘If you do not accept upon yourself (our authority), go out to the desert of Atad and there be a slaughterer [no longer a sage], and Nehunion a sprinkler.’ He [Hananiah] read the first [letter] and honored them, the second and honored them, the third – and wished to dishonor them. They told him: You cannot [dishonor us now], for you have already honored us. R. Isaac stood up and read in the Torah: ‘These are the festivals of Hananiah the nephew of R. Joshua!’ They [with Hananiah] said: ‘These are the festivals of the Lord!’ (Lev. 23:4). He [R. Isaac] replied: By us! R. Nathan arose and completed (read the *haftarah* from the prophets): ‘For out of Babylonia shall come Torah and the word of God from Nehar Pekod.’ They [with Hananiah] said: ‘From out of Zion shall come Torah and the word of God from Jerusalem’ (Isa. 2:3). He [R. Nathan] said to them: By us! He (Hananiah) went and complained about them [R. Isaac and R. Nathan] to R. Judah b. Bathyra at Nisibis [for advice]. He (Judah) said to him

[Hananiah]: After them, after them ... He (Hananiah) rose up and rode on his horse. Whither he reached he reached (and corrected the local calendar), and whither he did not reach – they observe in error.”

One obvious important point here is that the *Jerusalem Talmud* (as well as the *Babylonian Talmud*'s account of the same incident) accept the application of Isa 2:3 and Micah 4:2 to the situation. In this context this implies that some sage in Israel must make the decision rather than some sage in Babylonia. To what extent this is a fully true account we do not know, but it does portray the acceptance of the sages in Babylonia to the reasoning based upon Isa 2:3 and Micah 4:2. Modern Jewish commentators such as Gafni and Neusner (and others that I have seen) do not question the reasoning based upon these prophetic Messianic contexts applied to a non-Messianic age.

My conclusion to this discussion concerning Isa 2:3 and Micah 4:2 is that because the New Testament does not require an exact contextual match in order to apply a verse in the Hebrew Bible to some situation, and since Jews generally have no problem applying the principle in these verses to give weight to the testimony of those who have situated themselves in the land of Israel, neither do I have any problem with applying this principle in limited ways. Certainly if a clearly illogical ruling comes from someone in Israel, I do not have any motivation to accept such a ruling.

In 1997 someone asked me whether I would accept the calendric decisions of a new Jewish Sanhedrin in Israel if it began to function and make rulings on the calendar. My response was that if such a Sanhedrin made rulings that were based upon the biblical calendar, I would accept those rulings. But, for example, if arbitrary postponement rules were adopted by that Sanhedrin, I would not accept it. Nevertheless, a reconstituted Levitical priesthood should perform the determination of the calendar based on Num 10, not a Sanhedrin. It does bother me that some Jews go to the Talmud to substantiate the authority of a Sanhedrin rather than to the Tanak. The Talmud views the choosing of the 70 elders in Num 11:16-17, 24-25 as the first Sanhedrin, and uses this to show that the ideal body of elders for Israel is the Sanhedrin. This command for Moses to select 70 elders was a response to Moses' complaint to have the burden of dealing with all the problems of all the people lifted from him (Num 11:14-15). These 70 were to be disbursed throughout the people to deal with individual problems and disputes between parties, not to convene as one body as a substitute for

Moses. You never see any example of this body of 70 meeting together in one place.

[60] Two Days for the Start of the Seventh Month

Should there occasionally be times that the first day of the seventh month will be celebrated for two successive days today? This is the subject of the present chapter. This partially concerns the question of whether people to the east of Israel up to the IDL should begin to observe the first day of the seventh month before anyone in Israel has an opportunity to observe the new crescent.

Isa 2:3; Micah 4:2 says, “the law will go forth from Zion”. I take this to imply that when the Messianic kingdom is established, the declaration of the first day of the numbered new moons will be made from Zion. I also take this to imply that witnesses for the visibility of the new crescent from Israel will be accepted by the governing authority in Zion, and that such witnesses will have to testify that they saw the new crescent before the governing authority in Zion. It might happen that some audiovisual technology may be used so that witnesses may appear before some technology station away from Zion and be questioned from Zion. Maybe some transportation device will convey witnesses to Zion using automation so that they will not have to ride a horse or a camel. Maybe a biometric device for identification along with the Internet will be used, and no travel will be necessary.

In today’s society witnesses for having seen the new crescent communicate to at least one of two web site hosts. Then the result is sent out via email to individuals who have signed on to the emailings. In other words the Internet is used as a modern technology tool to inform people concerning witnesses for the sighting of the new crescent.

If the astronomical conditions for sighting the new crescent are borderline so that no one can accurately predict whether the new crescent will be seen (if the weather is clear), then all people who live to the east of Israel up to the IDL should begin to celebrate the first day of the seventh month in advance of receiving Internet reports. It may turn out that such people will indeed celebrate two successive days for the first day of the seventh month, just as would occasionally have happened to ancient Israel as indicated by I Sam 20:27, 34.

In ancient times transportation methods were slow, so that if witnesses of the new moon had to travel from far off in Israel, the priesthood might have to wait several days for the witnesses to arrive. If no witnesses testify for the first day and the second day, how long should the priesthood wait? Why not wait up to the time of the ninth day of the month to accommodate the fast day, the tenth day of the seventh month? Priests can accept the testimony of witnesses retroactively before the tenth day of the seventh month and thus avoid artificially limiting the location of witnesses within Israel. This is sensible and workable in ancient times. Anciently camels could run at 40 miles per hour and walk for long periods at half that speed so that within a couple of days it would be possible to travel from the southernmost part of ancient Israel to Jerusalem.

Without predictive mathematical astronomy in ancient Israel, there was often uncertainty of the first day of the new month during several days of waiting for witnesses to testify for having seen the new crescent. In the case of the first day of the seventh month, it is virtually certain that they often kept two successive days for that festival because of no reports of visibility on the first of the two possible days for sighting the crescent. Today, due to computer calculations, there is uncertainty under rare circumstances, assuming we accept visibility from desert regions of Israel where it almost never rains. When actual witnesses from Israel are available, if we reject their testimony and only use a computer calculation, it is certainly true that we make matters easy for ourselves, but then we set ourselves up as an authority that contradicts the ancient use of human instruments for sighting as originally intended. In this modern age, people often want to be able to plan everything precisely in advance. If we have uncertainty due to a borderline case in a rare circumstance, we can still plan for two successive days and have ourselves covered. People can plan an airplane trip one extra day ahead of time so that either event will work out okay.

[61] What if the Whole Earth may Sight the Crescent to start the Month?

If the boundary for ending the sighting point for visibility of the new crescent does not stop at the borders of the land of Israel, where does it stop? The further to the west one goes, the easier it becomes to see the new crescent, although higher than about 4000 feet above sea level it gradually becomes ever easier to see the crescent, and low humidity favors seeing the new crescent. How far to the west can one go? The natural answer based upon its modern acceptance is the IDL in the Pacific Ocean. If one goes

there, then everyone's attention would be focused on the IDL to give the very last look to the most western line before deciding that that day will not suffice for starting the new month. In other words, some islands in the Pacific Ocean would get all the attention instead of the land of Israel or its headquarters, Jerusalem. That would mean that local or worldwide visibility to determine the new crescent would be redefined to visibility at some islands in the Pacific Ocean. This makes no sense.

If one proposes that the IDL should be totally ignored and the exact moment of the first sighted crescent should be used to determine the start of the new crescent for the whole earth, this method will often cause some line along a landmass to separate one day beginning at sundown from the next day on the eastern side of the line. The reason for this is that a new day begins at sundown rather than some random time within a day. Thus neighbors will not be in harmony on the day that begins the new month and confusion will result. Another problem is that this method will sometimes produce a one day difference with the day that would have been selected for the new moon day in Israel under ancient circumstances of the Levitical priesthood.

[62] The Ancient Situation Outside of Israel

Suppose some ancient Israelites went exploring on a ship to North America. How would they begin a month? Without the Internet, without long distance telephone service, et cetera, they could not contact (even through intermediaries) the high priest for a knowledge of when each month began. They would have no choice but to use visibility of the crescent from wherever they were. If such a ship gave rise to two colonies separated by 100 miles, and if these colonies remained isolated from one another, there would no doubt be months in which they began a month one day apart. If they kept in contact with one another, then it is reasonable to think that the colony with rainy weather would accept the witness of the other colony, so that both would be in harmony on the start of a month. As we add more colonies it becomes ever more difficult to hypothesize how one could define local visibility. Nevertheless, with primitive isolation of settlements outside of ancient Israel, there is no confusion so that Ps 133:1 would not apply. It is only after significant communication is possible and the modern age enters the scene that confusion enters.

[63] Modern Technology makes a difference

Anciently, if appropriate technology were available, the ideal situation implied by Num 10:10; Isa 2:3, Micah 4:2 would result in all people everywhere accepting the word of the high priest, whose responsibility would include questioning witnesses who came from the Israel. Some people imagine that it is “not fair” to use modern technology to report on such visibility, and instead we must pretend we only have what people had in the days of ancient Israel. Such pretending should also include pretending we have no telephones, pretending we have no automobiles, pretending we do not have modern computers, pretending there is no Internet, even pretending we are in ancient Israel, i. e., in the Promised Land because that is where people had access to Scripture. Certainly in Israel all were united on the day, following the lead of the high priest. Hence rainy areas accepted testimony from clear weather areas in Israel.

[64] Num 10:10 Avoids Confusion

According to Num 10:1-2, 8-10 the Levitical priesthood is commanded to blow two silver trumpets on the first day of each month. The Levites were commanded to be disbursed in 48 cities throughout the 12 tribes (Num 35:2-8), not all over the world. The priests must observe, or reliable witnesses must inform them where they are, concerning the new crescent (Deut 17:6; 19:15; Mat 18:16; II Cor 13:1; I Tim 5:19). In concept, even though we do not have the Levitical priesthood functioning today, one must still view matters from the standpoint of the priesthood blowing trumpets on the first day of the month using two silver trumpets, implying they were being blown from one location. The biblical focus of attention for world government is on Israel, and specifically Jerusalem (Deut 11: 11-12; Ps 132: 13-14; Isa 2:3; Micah 4:2).

[65] Differences between the Sabbath and the New Moon

In ancient Israel there was certainly a difference between how each Sabbath began throughout Israel and how each month began throughout Israel. Each Sabbath began based on sundown for each person. While the time of sundown might vary by a minute throughout Israel, the beginning of the month did not begin this way. According to Num 10:10 with ps 133 the Levitical priesthood was commanded to blow two silver trumpets to officially announce the beginning of each new month. If someone and his neighbor observed the new crescent together in a difficult to observe circumstance and they neglected to appear as a witness before the

appropriate priests, and if no one else appeared before the priests to testify for having seen the new crescent, the priests would not have blown the trumpets and the new month would start a day later. Thus those two witnesses who failed to appear before the priests would not begin the new month when “it came to them”, but would have to use the starting of the new month according to the determination by the priests, when they blew the silver trumpets. In ancient Israel when the holy days were kept in one central place (Jerusalem after the first six years of King David's reign), those two witnesses could not argue with the priests when they appeared for the festival at the middle of the month. The priests would have no choice but to say to the two witnesses: “Why didn't you come to us near the start of the month and testify at that time? If you had done so, then we would be starting the feast one day sooner. Now it is too late to testify.”

The point being made here is that merely because we keep the Sabbath when it comes to us according to the IDL, that is not a deep enough or thorough enough examination and explanation of the different issues involved with the start of the month. The concepts for the month start and the Sabbath start were different in ancient Israel, yet the need for avoiding confusion is the same. Levitical priests did not have to blow the trumpets to officially notify everyone in Israel that the Sabbath had begun. It is certainly true that the Levitical priesthood does not exist today, but one must consider how one might sensibly approach this matter today given what we do know and the ever present need to avoid confusion among saints that are spread out in the world, often in close proximity to one another (Ps 133:1).

Since we cannot define "local visibility" to cover all circumstances away from the north and south poles, and since our Creator, who wants us to worship Him on the festivals, favors mental peace in unity (Ps 133:1), the way to attain that peace is to use the implication of Paul in Acts 18:21 in which he showed respect for the determination of the calendar by the Levitical priesthood by wanting to be there for the feast. Num 10:10 is there to achieve unity in ancient Israel. The central declaration of the new moon by the priesthood was not needed for the Sabbath even though the trumpets were also blown on the Sabbath because it is also an appointed time according to Lev 23:1-4. The announcement for the new moon of the seventh month had to reach all of Israel quickly if the ending month had only 29 days, or else people would needlessly keep two days as the new moon of the seventh month. Such an announcement all over Israel was not needed for the Sabbath.

When people live some distance outside the temperate zones, even with clear weather there will occasionally be a 31 day month based upon the concept of only personal eyeballs doing the looking (no phone calls, no Internet, no automobiles, no carrier pigeon communication, no fire signals, etc.). Thus the basic principle of a maximum 30-day month can no longer be used from outside of Israel with only personal eyeballs doing the looking. Then what does one do when it is raining or very cloudy and only depending on personal eyeballs (do you sometimes have a 32 or 33 day month)?

[66] Does the spread of saints around the world change the calendar?

The Levitical priesthood is a genealogical priesthood with physical duties, physical objects, and a physical service, although that priesthood was expected to teach spiritual laws and principles (Lev 10:8, 11; Mal 2:7). The example of the sudden miraculous death of Uzzah seen in II Sam 6:6-7 (without the involvement of a human court) shows that the physical duties explicitly assigned to the Levitical priesthood are not to be usurped by others. In other words, the principles that are known about the calendar that are based upon the existence of the Levitical priesthood are not to be arbitrarily altered by others not having such authority. See the prior chapter titled, "Authority of the Levitical Priesthood from the Tanak". In effect, this means that the spread of saints around the world should not destroy the conceptual operation of the Levitical priesthood, which is in temporary exile. To be specific, the priesthood was assigned to dwell within the boundaries of ancient Israel ((Num 35:2-8), so that those boundaries should confine the region for testifying for having seen the new crescent. Otherwise this priesthood is not respected (Ps 133:1-3; Num 10:10) and, in effect, the calendar is changed.

Let us suppose that modern communication prevails, so that the sighting of the new crescent from Israel is known, assuming that the sky is visible in a normal sense with occasional poor weather. If two different groups of saints are in the same geographical area outside of Israel, and observers in both groups ignore the knowledge of what was seen in Israel and come to different conclusions for the day to start the month based upon what they saw separately in each group, and then members within each group separately decide on two different days, they would figuratively be blowing their silver trumpets contrary to each other, and at least one group would be deciding on a day in disagreement with observers from Israel and hence in

disagreement with the evidence that would be accepted by the Levitical priesthood if it functioned today. This destroys the conceptual peace and unity implied in Ps 133:1-3, this disrespects the authority vested in the Levitical priesthood (Ps 133:1-3; Num 10:10), and this implies a rebellion analogous to Uzzah (II Sam 6:6-7).

Num 10:10 is there to avoid disunity in ancient times. Since we can know whether the new moon was sighted in Israel today by means of mass communication, this is a unifying principle that respects biblical principles.

It is true that the Levitical priesthood is in temporary exile today, yet the principle in the law is that in the mouth of two or three witnesses a matter is to be established (Deut 19:15), and this principle was applied in other situations (Mat 18:16). To avoid confusion the witnesses should be drawn from where the Levitical priesthood was to reside, namely the boundaries of ancient Israel.

[67] Historical Evidence for Sighting the New Crescent

In the early first century, Philo of Alexandria reported that the new month for Jews began with the sighting of the new crescent after the conjunction (see page 333 of Philo_7, Special Laws 2:41). Historical evidence concerning testifying about having witnessed the new moon does not exist before the *Mishnah*, which dates from about 200 CE. While I do not accept the *Mishnah* as an inspired document or for an accurate valid statement concerning Jewish history, by combining the written witness of Philo with corroboration from the *Mishnah*, it is sensible that witnesses of the sighting of the new crescent were expected to testify.

[68] Should only Jerusalem be used to Sight the New Crescent?

If we today were to propose that only the sighting of the crescent from Jerusalem mattered (avoiding areas of Israel outside of Jerusalem), then since there are people today who report on the sighting of the crescent on the Internet, we would often be changing at the beginning of the first and seventh months based on rain or heavy clouds over Jerusalem, even if other areas of Israel were clear, it was not a borderline case, and humidity was not an issue. This shows that Jerusalem sighting does not make matters easier, but actually complicates matters because there would be more uncertainty on more occasions than using visibility throughout Israel, which includes desert

regions so that computer predictions would only fail in some rare borderline cases.

If we had no reports of actual sighting from Israel in the modern world, but wanted to avoid confusion and utilize the concept of sighting the crescent based upon Gen 1:14-18, then a calculation of the high probability of sighting the crescent is the only choice, and the vast majority of the time (no borderline condition or slightly under borderline where low humidity is a question) the calculation and actual sighting will agree. The calculated dates will work over 90 percent of the time in the latitude of Israel under 4000 feet above sea level.

[69] Starting the Month when it comes to you

Today the part of the world east of Israel always starts the Sabbath before Israel, and the part of the world west of Israel always starts the Sabbath after Israel. Thus India starts the Sabbath before Israel and the United States starts the Sabbath after Israel. To be consistent with the way we keep the Sabbath, we should also begin the start of the month according to the same principle: the people in India begin the start of the month before the people in Israel and the people in the United States begin the start of the month after the people in Israel. This principle extends to the IDL and is what mainstream Judaism uses.

[70] Actual Sighting from Israel Today

In September 2004 a new problem arose when the Karaites in Israel introduced a new concept of what constituted a valid observation. They allowed momentary sightings of something that would not even have been recognizable anciently as a crescent to be validly considered a sighting of a crescent. This was done on the basis of having observed the moon with binoculars and a tripod for steady viewing for some time, so that they “knew” it was the crescent, although no one in ancient times could have known it was the crescent. If an alleged sighting from the Karaites is more than half of one degree below Karl Schoch's curve, then I do not trust that sighting as having been acceptable in ancient times, most especially if the sighting is not done from a place of low humidity. Details must be provided by those who issue reports in such unusual circumstances.

[71] The Process of Declaring the New Moon

(A) Israel as the Geographical Anchor

Num 10:10 shows that the Levitical priesthood was to blow two silver trumpets to declare that a new month had begun. Through this brief statement we can at least say that the priesthood had the responsibility to gather testimony concerning the sighting of the new moon and make a decision of whether to declare it. Since the priesthood was commanded to dwell within the boundaries of ancient Israel, that place is the region from which testimony would have been taken as long as the Levitical priesthood existed. Jumping to today's society in the modern world, if multiple peoples around the world were to arrive at an independent determination based upon individual arbitrary regional decisions of "locally" sighting the new crescent, that implies conflict and disunity in certain geographical areas, making two different days holy even in the same place where two different groups may overlap in geography. This conflict and disunity is contrary to Ps 133:1. Different people may invent different concepts of how to determine a new moon in their own area in terms of distance and height above sea level, and there is no biblical guideline for such a definition. As long as people elsewhere are able to communicate with people in Israel, the only way to avoid disunity and also respect the concept of Num 10:10 (even recognizing that the Levitical priesthood no longer exists), is to use the boundaries of Israel as the geographical anchor for visibility of the crescent.

(B) A minimum of Two Witnesses for sighting the New Crescent

Deut 17:6; 19:15 declares, "on the mouth of two witnesses or on the mouth of three witnesses a matter shall be established". This is quoted in Mat 18:16 and II Cor 13:1 as applying to other situations.

(C) Only a continuous Naked Eye sighting should be admitted as a Witness

As an avid student of the history of ancient astronomy I can say that the invention of the telescope is not provable before 1608, but in that year several Europeans constructed telescopes about the same time. Galileo first constructed one in 1609 and made important improvements. See pages 326-329 in the book by John North. Ancient peoples showed great interest in the moon, yet there is no ancient drawing that shows details of the surface of the moon that would require a telescope, nor is there any historical evidence that ancient peoples invented a telescope.

When people discuss the sighting of the crescent today, it seems generally agreed that evidence for the new crescent should not be accepted by methods that were not available in the days of the functioning of the Levitical priesthood. This means that if an individual is in an airplane flying over Israel, that altitude would prevent accepting such a testimony for having seen the new crescent. In fact, it means that the observer should be standing on the ground or sitting on some object that is on the ground, and certainly using naked eye observation at the time of declaring having seen the new crescent. Furthermore, the sighting should be a continuous one rather than one that lasted only about a second, even if separately repeated later for about a second. This prevents a vivid imagination from fooling a sincere mind. The question of how much use of a telescope or binoculars may be acceptable is treated next.

(D) Partial use of a Telescope or Binoculars

The principle that evidence for the new crescent should not be accepted by methods that were not available in the days of the functioning of the Levitical priesthood is generally accepted, although there are exceptions to almost everything when human opinions are taken. But sometimes observers go to great lengths to enhance the likelihood that they will see a new crescent with the naked eye. For example, they will use a knowledge of modern astronomy and mathematics to correctly predict where and when in the sky the crescent should be seen, and then focus a telescope upon an accurate mounting pointing to that location. When they finally see it at that location through the telescope, they will then try to locate it with binoculars. Then they will periodically remove the binoculars to try to see it with the naked eye. Then upon seeing it continuously with the naked eye, they will declare they have seen the new crescent. Obviously different people will have different opinions about this process.

One aspect that relates to mathematics and binoculars deserves special comment. This has to do with the refraction of light from an astronomical body as it travels to the eye of an observer. Having watched some new crescents as they lowered down to the horizon from my sighting location that has been near the latitude of Israel (especially the area around Dallas, Texas), I noted that they changed shape significantly during last part of the descent. This change of shape is due to the increasing effect of refraction as the light from that object neared the surface of the earth. The density of the

earth's atmosphere increases as one approaches sea level. As the density of the atmosphere increases, refraction also increases. This increasing refraction distorts the shape of what one sees. When it gets low enough, it ceases to have the characteristic appearance of the new crescent, and what one sees can be confused with a cloud or a piece of a cloud. If one sees this for the first time in its very low position in the sky, one will be very uncertain that this is the new crescent, but if one has seen it that way all along for the previous 15 minutes, there will be no reason to doubt that it is the new crescent.

When the crescent is seen from the northern hemisphere, it looks different near the time of the vernal equinox compared to near the time of the autumnal equinox. Near the vernal equinox it looks somewhat like a bowl whose bottom is horizontal and down. Near the autumnal equinox it looks somewhat like a backwards letter "C". In the spring when it gets near the horizon, the bowl shaped crescent gets flattened to a very short horizontal straight line, and anyone seeing this who had not already been watching it before would not think this was a crescent since all the curvature would be gone. In the autumn when it gets near the horizon, the backwards "C" shaped crescent gets flattened to the outline of what appears to be an extremely narrow squashed tip of a cigar, but not filled internally, and anyone seeing this who had not already been watching it before could easily mistake it for the outline of a cloud.

Armed with the above information, let us contemplate the following. Consider two observers, observer "A" using the sophisticated modern techniques of an aimed mounted telescope and binoculars, and observer "B" who is nearby with only his eyes to see, but "B" is not in contact with "A". If this is a very difficult case in which to imagine seeing the new crescent and both of them happen to first see it with their naked eye at the same time, and moreover, the moon is very close to the horizon, the thoughts in their minds are likely to be quite different. Observer "A" is likely to think as follows. I have been watching this crescent all along for many minutes with binoculars and now I finally see with my naked eyes what I have been looking at all along, so I know it is the new crescent. Observer "B" is likely to think as follows. I see something out there, but I'm not quite sure what I am looking at, because it doesn't have the typical characteristic appearance of the new moon; it could be the latter stage of what a new moon looks like, but it is so low that it's difficult to be sure if this is a crescent or perhaps a piece of cloud.

If one accepts the principle that evidence for the new crescent should not be accepted by methods that were not available in the days of the functioning of the Levitical priesthood, then one must consider the difference between the thinking of observer “A” and the thinking of observer “B”. While I would not object to an observer knowing where to look and even using a telescope and binoculars to pinpoint the direction to look, upon seeing the object with my naked eye, I would have to make a judgment of whether the appearance of the object is sufficiently close to a crescent that if I were seeing this for the first time, I would be convinced this is a crescent rather than a piece of cloud. If the appearance alone is not convincing, even though I would in reality know it is the new crescent because I had been observing it for a number of minutes with binoculars, it should not be admitted as evidence for seeing the new crescent because it would be unconvincing to an ancient observer.

This means that when a report is given by observers of the new moon in a difficult situation where binoculars or a telescope was used, the report should include details of approximately how long it was seen continuously with the naked eye, how its shape appeared to the naked eye, and a judgment of whether it would have been convincing to an ancient observer who knew approximately how it ought to appear at this time of the year. If it would not have been convincing to an ancient observer, then it should not be accepted as a witness to the new crescent.

Summary: The problems with using local visibility are:

- (1) How is it defined in today's world?
- (2) How is it consistent with Num 10:10 with Ps 133 where the priests determine the new month from Israel?
- (3) How can it avoid confusion and disunity (Ps 133:1)?
- (4) Does it avoid arbitrary decisions of distance for accepting witnesses?

The advantages of using visibility of the new crescent within Israel are:

- (1) The definition is simple.
- (2) It is consistent with Num 10:10.
- (3) It avoids confusion.
- (4) Over 90 percent of the time it is not a borderline situation and it is predictable.
- (5) This, along with the IDL, best fulfills the philosophical principles stated at the beginning of this study.

The use of the IDL for the 24-hour day, starting with sundown as it gradually sweeps across the globe, has attained worldwide acceptance by keepers of the Sabbath, and this principle for the start of a month has been accepted by mainstream Judaism (Orthodox, Conservative, and Reformed), and the Karaites also accept it, but typically starting one or two days later than the MCJC. This method does cause people to the east of Israel up to the IDL to begin to observe the first day of the seventh month prematurely, perhaps on some occasions causing two days of observance. In ancient times Israel did the same thing as indicated in I Sam 20:27, 34. Hence this is not a significant fault. The sighting of the new crescent from within the boundaries of Israel should determine the day, and this day should be accepted around the world based upon the IDL with sundown as it sweeps across the globe.

[72] Two Web Sites with New Crescent Reports from Israel

There are two web sites hosted from Israel that report on new moon sightings from Israel, and they do not consider reports from outside Israel to be significant. One of them is hosted by Dr. Roy Hoffman, who works for the Department of Organic Chemistry of The Hebrew University in Jerusalem (see www.geocities.com/royh_il/). I have seen some emails forwarded to me that make it clear that Dr. Hoffman favors the Rabbinic writings and the commentaries by Orthodox Jewish sources. Some of his reports of borderline sightings of the new crescent are more detailed than the other web site. The other one is hosted by Nehemia Gordon, a spokesman for the Karaites in Israel (see www.karaite-korner.org). These web sites provide information of sightings, and then those that receive the emails are free to decide whatever they want on the basis of these reports. Nehemia Gordon tends to make statements that state what month this is on the basis of his tenets, but no one is forced to agree with his conclusions.

[73] Authority in Israel Distorted by Josephus

(A) Josephus on the Biblical Court System and the Biblical King

In matters pertaining to human authority over the Israelite people concerning the biblical court system, it is instructive to see how Scripture compares with Josephus. Deut 17:8-13 discusses what to do when difficult legal cases arise and the local judges cannot decide. Verse 8 together with Deut 12:5 (as interpreted in the later context when Jerusalem would be the capital city),

indicate that such cases would be transferred to Jerusalem. Deut 17:9 explains what should happen next. The authority figures are mentioned in Deut 17:9 [NKJV], “And you shall come to the priests, the Levites, and to the judge there in those days, and inquire of them; they shall pronounce upon you the sentence of judgment.” Verse 12 states that the verdict is given by “the priest” or “the judge”. This should be understood in light of Deut 19:17 where a single case is brought before “the priests and the judges”. When this is read by itself without looking outside the Bible for interpretation, we do not read about one national body meeting under one roof (one Sanhedrin), but instead, individuals from among priests, Levites, and “the judge”; however, an unstated quantity of these people judge each case. Verse 9 indicates a plurality of people in authority with emphasis on priests and others of the tribe of Levi, but people from other tribes are not excluded from serving on the court. In Deut 21:5 where the cities all over the country are in the context (verses 1-9), the priests are said to be involved in settling every dispute. There is nothing specific in the Tanak to cause one to insist that the same single body of people in Jerusalem is to judge every case that cannot be decided by local courts throughout the land.

Note that Deut 17:8 does say “gates”, which means courts, and it should be accepted that Deut 17:9 necessarily implies at least one court for judging civil cases brought to it from local courts. This permits the likelihood, especially if the population is large, that there would be a group of high-level courts in Jerusalem, and any case that is too difficult for the local courts may be assigned to one of these courts. On the other hand, this may also be interpreted so that if the population were large, Jerusalem would have an intermediate level of courts that would first consider cases brought to it from local courts, and then any cases that could not be resolved by these intermediate level courts would go to one highest court. The Pentateuch does not assign any specific role to the high priest within the court system, but priests do have a prominent role throughout the court system (Deut 17:9; 19:17; 21:5).

When reading Josephus concerning the court system, we must carefully distinguish between his portrayal of the law of Moses and his statement of what actually happened in Jerusalem according to his personal experience as he chooses to tell it. After devoting a considerable number of pages to history, Josephus returns to discussing the law of Moses, and provides a preparatory comment as follows in Ant 4:196 (pages 569, 571 in Josephus_4), “But here I am fain first to describe this constitution,

consonant as it was with the reputation of the virtue of Moses, and withal to enable my readers thereby to learn what was the nature of our laws from the first, and then to revert to the rest of the narrative. All is here written as he left it: nothing have we added for the sake of embellishment, nothing which has not been bequeathed by Moses.” The readers of Josephus understand the constitution to be the laws by which the country is governed, and he uses this word to refer to the laws of Moses that pertain to the government and possibly some other laws as well.

In Josephus's version of the local courts in the law of Moses, he wrote (page 579 in Josephus_4), Ant 4:214, “As rulers let each city have seven men long exercised in virtue and in the pursuit of justice; and to each magistracy let there be assigned two subordinate officers of the tribe of Levi.” Here Josephus adds specific numbers of people to serve as rulers, and he certainly does not leave out the tribe of Levi entirely, but he does not require any role for priests and insists on at least a minor role for Levites. This is clearly a distortion of the major biblical role for priests.

We next examine the situation in which a case is too difficult for a local court. This is parallel to Deut 17:9. A careful translation of Josephus's Ant 4:218 is given on page 32 of Pearce, “But if the judges do not understand how they should give judgment about the things that have been laid before them - and many such things happen to people - let them send the case up untouched to the holy city, and when the chief priest and the prophet and the senate [Greek: *sunedrion* (Sanhedrin)] have come together, let them give judgment as to what seems fit.” Note that Deut 17:9 gave a primary role to the priests and Levites without mentioning the high priest. Josephus adds the high priest, but does not insist on any other priests, although he may assume this is to be included in the Sanhedrin. He also maintains that Moses intends there to be only one high court, the one national Sanhedrin. Josephus also includes “the prophet” within the meeting of the Sanhedrin, a matter about which Moses wrote nothing. In several ways Josephus distorts the natural meaning of the biblical account.

Several years after Josephus wrote his *Antiquities of the Jews*, he wrote his last work, *Against Apion*. In this last work he was not giving a thorough treatise on the law of Moses, but he did mention the attitude of the Jews toward this law, and then he made a few statements about the law in relation to the court system. In AA 2:183 (page 367 of Josephus_1) he wrote, “To us [Jews], on the other hand, the only wisdom, the only virtue, consists in

refraining absolutely from every action, from every thought that is contrary to the laws originally laid down.” Concerning the court system he contradicted his earlier statements above where he previously diminished the role of the priests in the court system and governing in general, except for the high priest. In AA 2:187 (pages 367, 369 of Josephus_1) he wrote, “But this charge [for the priests] further embraced a strict superintendence of the Law and of the pursuits of everyday life; for the appointed duties of the priests included general supervision, the trial of cases of litigation, and the punishment of condemned persons.” In AA 2:193-194 (page 371 of Josephus_1) he wrote, “The priests are continually engaged in His worship, under the leadership of him who for the time is head of the line. With his colleagues he will sacrifice to God, safeguard the laws, adjudicate in cases of dispute, and punish those convicted of crime. Any who disobey him will pay the penalty as for impiety towards God Himself.” In this context Josephus is summarizing the ideal form of government as a theocracy controlled by priests as it was supposed to be in the sacred writings of the Jews. Here he makes no explicit mention of what happened in his lifetime, but the assumption is that this did parallel what occurred in his lifetime. Of course he knew the correct biblical role of the priests in the court system when he wrote his earlier work, but in that earlier work he deflated the role of the priesthood within the court system. This does show inconsistency in Josephus. However, even in his last work he did not mention Levites, but only the subgroup of the Levites called priests. Often scholars disagree with one another in their conjectures for his motives.

In Deut 17:14-20 Moses describes the appropriate behavior for future kings of Israel, and this does not show that the king should share his rulership with other men. Comparing this to the corresponding description in Josephus, we see the following on page 583 of Josephus_4, Ant 4:224, “Let him [any future king of Israel] concede to the laws and to God the possession of superior wisdom, and let him do nothing without the high priest and the counsel of his senators ...” Here Josephus puts a non-biblical restraint upon the king's authority so as to force him to share it with the high priest and a body of officials. This is a significant distortion of the authority of the king in ancient Israel.

Josh 2 describes the spying mission of two men into Jericho, and verse 23 states [NKJV], “So the two men returned, descended from the mountain, and crossed over; and they came to Joshua the son of Nun, and told him all that had befallen them.” Comparing this to the corresponding description in

Josephus, we see the following on page 9 of Josephus_5, Ant 5:15, “So having made this compact, they departed, letting themselves down the wall by a rope and, when safely restored to their friends, they recounted their adventures in the city. Joshua thereupon reported to Eleazar the high priest and to the council of elders what the spies had sworn to Rahab; and they ratified the oath.” Here Josephus portrays an authoritative decision to accept the private agreement between the two spies and Rahab being officially accepted only by mutual agreement of Joshua along with the high priest and a senate. Thus Josephus shows Joshua as unable to make this authoritative decision alone. Hence Josephus distorts the Bible.

Using singular verbs in the Hebrew, Joshua is told in Josh 1:5, “As I was with Moses, I will be with you.” This is one man rule in a theocracy, but Josephus transformed it into rule by a committee with a high priest.

These several examples of biblically distorted interpretation from Josephus show a bias of elevating the authority of the high priest and one national senate or Sanhedrin so that Joshua and future kings are expected to share authority with them rather than act alone in political or civil matters. This had the effect of weakening the authority of Joshua and the kings of Israel, all having one-man rulership. But in *Antiquities of the Jews* Josephus diminished the role of the priests and Levites in the court system of Israel compared to the Tanak. Yet in *Against Apion* Josephus gave proper emphasis to the priesthood, but still neglected the Levites.

(B) Resolving Contradictions in Josephus over who had greater Authority

Let us summarize some of the contradictions in Josephus concerning his portrayal of the biblical court system and authority in general. In *Against Apion* (abbreviated AA and published c. 100) the court system gives much authority to the priesthood, and even outside the court system the priesthood has the greatest visible authority. Notice the next passage.

In AA 2:188-189 (page 369 of Josephus_1), Josephus wrote, “Could there be a more saintly government than that? Could God be more worthily honoured than by such a scheme, under which religion is the end and aim of the training of the entire community, ***the priests are entrusted with the special charge of it***, and the whole administration of the state resembles some sacred ceremony?” Here Josephus gives the priests the sole authority over

the religion and sacred ceremony. Of course this assumes that Jewish society is normal, i. e., that the priesthood is practicing in the Temple.

In Ant 20:250-251 (pages 521 and 523 of Josephus_9), Josephus wrote, “Now those who held the high priesthood from the times of Herod up to the day on which Titus captured and set fire to the temple and the city numbered twenty-eight in all, covering a period of one hundred and seven years. Of these some held office during the reigns of Herod and Archelaus his son. After the death of these [two] kings [Archelaus died in 6 CE], the constitution became an aristocracy, and *the high priests were entrusted with the leadership of the nation.*”

In *Wars of the Jews*, published c. 79, Josephus makes no clear statement concerning whether the Pharisees or Sadducees have control over one another.

In contrast to this, in *Antiquities of the Jews* (published in 93/94), the court system greatly reduces the role of the priesthood, gives much place to the Levites in general, and also gives prominence to the judge whose lineage is not mentioned. When discussing the court system in his paraphrase of the Bible, which is sometimes distorted, he does not explicitly mention the words *Sadducee* and *Pharisee*. However, in *Antiquities of the Jews* there are several places in which he compares the Sadducees, the Pharisees, and the Essenes. In these places he claims that the Pharisees have more authority and power than the Sadducees, and from the viewpoint of authority he leaves the Essenes in the background. Note the following example.

In Ant 18:16-17 (pages 13 and 15 of Josephus_9), Josephus wrote, “The Sadducees hold that the soul perishes along with the body. They own no observance of any sort apart from the laws; in fact, they reckon it a virtue to dispute with the teachers of the path of wisdom that they pursue. There are but few men to whom this doctrine has been made known, but these are men of the highest standing. They accomplish practically nothing, however. For whenever they assume some office, though they submit willingly and perform, *yet submit they do to the formulas of the Pharisees, since otherwise the masses would not tolerate them.*”

This section from Ant 18 in bold is a sharp contrast with the prior sections from AA 2 and Ant 20 in bold. The context of Ant 18:16-17 does not imply the existence of the Temple, but the other two contexts do imply its existence.

One way to reconcile this contradiction is to presume that in *Against Apion 2* and *Antiquities 20* he was referring to the time before 66 when the priesthood still functioned in a normal fashion, and in *Antiquities 18* he was referring to the time after 70 when the Sadducees lost its power base associated with the Temple because it no longer existed, it lost the tithe money because the Temple no longer existed, and it lost the recognition that was previously given to it by the Roman authorities. Thus all the grandeur was gone from the Sadducees. This approach has the advantage of obtaining an agreement with the New Testament. Ant 18 above contradicts the New Testament as seen during the early first century.

Notice John 12:42, "... because of the Pharisees they [the Jewish rulers] were not admitting, lest they should be put out of the synagogue." This shows the sway of the Pharisees over the people in the synagogues. The Temple was not a synagogue.

On page 445 of Deines, he gives the following careful translation of Josephus' Life 12, "In the nineteenth year of my life I began to lead a public/political life, whereby I joined with the program of the Pharisees, which is comparable to that which the Greeks call stoicism." The sweep of the life of Josephus shows that he was a political opportunist, and in Life 12 he wrote that at the age of 19 he decided to follow the program of the Pharisees. It is reasonable to conjecture that he was not a fully recognized Pharisee because he did not personally comply with all the requirements necessary for that. Thus his wording is merely that he decided to follow its principles, not that he was a member. As a political opportunist, he would have recognized the essential long-term reality indicated in John 12:42, and thus knew that there was power in having the loyalty of the masses behind him as the Pharisees had, even if this power was checked in the environment of the Temple. It appears that Josephus preferred the political power from the people compared to the money and grandeur from the contributions.

On pages 198-199 of Grabbe 2000 we see the following concerning Josephus's remarks about Jewish leadership, "Those sources [in Josephus] which give the Pharisees a general dominance of a religious belief and practice are those which come later in relation to parallel sources [*Antiquities of the Jews* compared to *Wars of the Jews*]. Thus, it is only two later passages in the *Antiquities* which state that public worship is carried out according to Pharisaic regulations and that the Sadducees are required to

follow them even when they hold office. This is not stated in the *War* and is not borne out in Josephus's other passages on the Pharisees [in the first century].”

A flagrant distortion of Scripture in the writings of Josephus is his fabrication of the existence of a national decision making body called a senate or Sanhedrin from the time of Moses and throughout the subsequent history of Israel. While it is true that in Num 11:16-17, 24-25, there was a selection of 70 elders to help decide and lead in some unspecified matters, this is not described as one chamber or unified body meeting in one place. Only the plural word “elders” is mentioned, and from this time onward there is silence about them. Josephus fabricates consultations of Joshua and of Israel’s kings with this Sanhedrin. He reads this institution from his lifetime into prior Israelite history, yet claiming he is merely repeating what is in the Bible.

(C) General Conclusions about Josephus

On page 290 in the concluding chapter of his second book about Josephus, McLaren wrote the following:

“This study has focused on the implications of trying to make use of the gold-mine [the writings of Josephus], particularly in terms of the nature of the relationship between Josephus, his narrative of events, and contemporary scholarship, in the reconstruction of first-century CE Judaea. Scholars have increasingly voiced the need to display caution in the application of Josephus's narrative in an effort to understand the dynamic of the society. In fact, reference to Josephus without some introductory words of caution is now extremely rare. With Josephus we are dealing with a biased source. In itself, such a statement should not be a concern. Josephus has provided his own understanding of what happened and scholarship has labeled this his bias.”

“The gold-mine begins to take on the appearance of a minefield. The one and only substantial narrative of events pertaining to the first century CE is biased. If we are to establish a means of understanding the data it is of fundamental importance that we be able to distinguish between the bias and the narrative of actual events. Where the real problem lies is being able to stop before we become dependent on Josephus's interpretation.”

The following are my conclusions about Josephus, and these concern my overall view, not merely the view based on the above examples.

(1) Josephus goes out of his way to exaggerate and boast about his own abilities in intelligence and knowledge of Jewish and biblical matters. He never claims to have any particular knowledge of mathematics or astronomy.

(2) Josephus goes out of his way to exaggerate and boast about the accomplishments of the Jewish people through history.

(3) Josephus portrays the actions of the Roman generals Vespasian and his son Titus in a manner that makes them appear more virtuous than reality. These men provided for the needs of Josephus, and he returns their favor.

(4) The primary audience for the writings of Josephus is the nobility in Rome whose culture included the Greek language and famous Greek writers and themes. He is writing to them with their definitions of terms in his mind. Josephus is biased toward the thought process and appeal of this audience.

(5) Near the beginning of his autobiography, which is called "Life", Josephus wrote that before he was 20 years old he made the decision to follow the position of the Pharisees in his public life. Therefore, in Jewish doctrinal matters, we should expect Josephus to be biased toward the sectarian views of the Pharisees.

(6) For matters that pertain to things that happened before the birth of Josephus, there were many writings that claimed to be historical in nature, concerning the Jews. Josephus picked whatever he wanted from these writings and used them for his purposes. Some of these are false, though Josephus has no way to know this.

(7) Josephus sometimes purposely distorts the biblical account for his own purposes. Therefore, one must be very cautious to accept what he writes as definitely true. He makes general statements that he will not distort anything, yet he boldly makes distortions, sometimes even contradicting himself.

Whenever there seems to be a desire to quote Josephus for some purpose, it is necessary to review the above list of biases in order to help to understand any possible way in which Josephus might be less than reliable. In the case of discussing I Samuel 20, it does not seem that the biases would affect what he had to say here. In the case of discussing the claim that Abraham taught the Egyptians mathematical astronomy, the biases of both (2) and (6) enter the picture. This claim appears to praise an important Jew, Abraham, as possessing knowledge that was highly respected among the nobility in Rome. Writings exist from before the birth of Josephus that claim Abraham taught the Egyptians astrology, but Josephus changed this to astronomy.

Scholars see no need to reject all of the writings of Josephus merely because there are biases in his writings. They seek to understand his biases so that they may evaluate where to accept and where to reject what he wrote. He is a mixed bag and must be read with caution and evaluation. There is no need to completely avoid him merely because some of what he wrote is not trustworthy. One may also scrutinize all of Philo's writings and find something objectionable, but that does not imply that Philo may not be used for anything.

[74] Josephus and his Aries Approximation

One passage from Josephus is referenced by some of the church historians between 300 and 600 CE, and they claim it helps to determine when the first biblical month occurs. This passage is now our subject. Josephus made the following statement in his *Antiquities of the Jews* (Ant 3:248, also referenced Ant 3, 10, 5) as very literally translated on page 302 of Feldman 2000, "In the month of Xanthicus, which among us is called Nisan and is the beginning of the year, on the fourteenth, according to the moon, the sun being in Aries, because in this month we were liberated from slavery under the Egyptians ...". This is typically simplified to the supposed rule that the 14th day of Nisan must be in Aries. Note that the word Xanthicus occurs in the passage.

Let us first consider whether any further clarification of Ant 3:248 might be attained by investigating the word Xanthicus. This word is the Greek (more accurately, Macedonian) name for a month. Ptolemy of Alexandria c. 150 C.E, wrote his *Almagest* in which he used Macedonian lunar month names. Ptolemy often gave credit for significant parts of his work to his Greek predecessor Hipparchus (c. 150 BCE), and we know that Hipparchus obtained many of his mathematical parameters used in astronomy from the Babylonians. On page 13 of Toomer 1984 he wrote, "The use of Macedonian month names [by Ptolemy] has rightly been taken to show that the Babylonian lunar months were simply called by the names of the Macedonian months by the Greeks under the Seleucid empire: if one computes the date of the first day of the 'Macedonian' month from the equivalent date in the era Nabonassar given by Ptolemy, it coincides (with an error of no more than one day) with the computed day of first visibility of the lunar crescent at Babylon. There is other evidence for the assimilation of the month names, but this is the strongest." In a footnote on this page

Toomer says that some of the Babylonian astronomical writings were translated into Greek using Macedonian month names perhaps as late as the time of Hipparchus, which was almost 200 years before Josephus was born. It is doubtful that the astronomical works of Hipparchus were available outside Alexandria where the advanced Greek astronomers lived, though Hipparchus spent much of his life on the island of Rhodes in the Mediterranean Sea some distance from off the coast of Alexandria. Hipparchus died about 150 years before Josephus was born. The astronomical works of Hipparchus were very difficult to comprehend and required an advanced education in astronomical terminology and mathematics to understand. It is difficult to imagine such an education outside Alexandria. Josephus never hints that he ever visited Alexandria, nor does he indicate any special ability in mathematics or astronomy. Ptolemy's mathematically advanced astronomical work was written c. 150 CE, long after Josephus died. We do not possess a plausible reason to think that Josephus would have been aware of this particular equivalence between the Babylonian month names and the Macedonian month names, yet it is possible. Since this equivalence in month names is documented by Ptolemy, this equivalence will be called the Ptolemaic equivalence below.

On pages 142-143 of Samuel 1972, based on evidence from data on coins and a horoscope, he proposes a chart showing an equivalence from the Babylonian month names to the Macedonian month names. This chart is exactly one month displaced from the Ptolemaic equivalence mentioned above, so that they do not agree. Secondly, using another chart on those same pages based upon approximately two dozen examples of month name equivalents in Josephus, Samuel provides the equivalence from the Macedonian month names to the Jewish month names. By joining these two translation charts, Samuel proposes that Josephus was equating the Babylonian month name with the identical timing of the similar sounding Jewish month name, but *using Macedonian names instead of Babylonian names* for the sake of his Greek readers, primarily the nobles of the city of Rome who would be in the best position to read his work. Samuel's proposal would be incorrect if Josephus had the Ptolemaic equivalence in mind. Samuel's proposal is merely speculation because we do not know what Josephus knew, nor do we know his intent by his month name equivalents. Specifically, we do not know whether Josephus was aware of the first chart mentioned above by Samuel. The greatest problem with this speculative theory by Samuel is that it contradicts the phrase of Ant 3:248 containing the word Aries, which is investigated next. Aries had a clear known meaning in

Rome where Josephus and his primary audience of Roman nobles lived. Discussing this theory proposed by Samuel, page 138 of Hannah 2005 concludes that the overall evidence does not lead to any strong conviction for any precise meaning from Josephus's use of Xanthicus in Ant 3:248. I agree that there are too many unknowns concerning Josephus's use of Xanthicus to draw any worthwhile conclusion toward understanding Ant 3:248 based on the word Xanthicus.

In two previous chapters the zodiac was discussed, and the reader should be aware of these now. Both Josephus and Pliny the Elder were given a tract of land in Rome on which to live at taxpayer expense. Pliny died in 79 and the two of them would have had opportunity to meet during the years 70 to 79. They were both well known figures among Roman nobility. Quotations from Pliny the Elder and two other Roman writers from his approximate time agree that **Aries began seven days before the vernal equinox**. In the first century it was only in the area near Alexandria that Aries was used in a manner that recognized its first day was on the vernal equinox. Josephus's primary audience was the Roman nobility who knew Greek and with whom he was able to socialize in Rome. That audience would expect Josephus to use the terminology expected in Rome and used by Pliny, who also socialized with the same nobility as Josephus.

On page 120 of Varneda 1986, he comments on Ant 3:248 as follows, "... the sun is in Aries, which indicates the days half-way through March to half-way through April ..." This is correct. If we subtract seven days from the vernal equinox we are at the middle of March. Varneda's remark agrees with Pliny. In the first century, the vernal equinox fell on March 22-23 in the Julian calendar used in the Roman Empire, although the Romans may not have known these precise dates in their own calendar. They would have known the approximate date of the vernal equinox.

Ant 3:248 is saying that the 14th day of Nisan must fall between mid-March and mid-April. This means that Nisan 1 must fall anywhere in March, so that it may fall as early as about three weeks before the vernal equinox. This rule does not neatly fit with any astronomical principle. It ties Nisan 1 into the Julian month of March. It cannot be biblically correct because it occurs at an astronomically awkward time that would be difficult to judge unless you simply determine whether the new moon occurs in the (astronomically artificial) Julian month of March. Since the Julian year is exactly 365.25

days, it is a little longer than a true solar (tropical) year, and thus the vernal equinox would gradually drift in the Julian calendar.

Ant 3:248 uses the well known concept of Aries to approximate the Jewish first month at that time. This rule is astronomically awkward and cannot be biblically correct. Yet it is astronomical in concept rather than agricultural.

Josephus published his *Antiquities* in 93/94, about 23 years after the Temple was destroyed. In a previous chapter about Philo of Alexandria, it was shown that Philo's view is that the Jewish first month did not begin before the vernal equinox. Thus there is a three week difference between Philo's view and Josephus's view concerning the start of the first Jewish month. The next chapter gives an explanation for this apparent contradiction.

[75] Destruction of the Temple and Nisan 1 moves into the Winter

In an earlier chapter abundant evidence was presented from the New Testament, Tacitus, and Trogus to show that that the priesthood controlled the Temple in the first century before the war broke out in 66. Num 10:10 shows a responsibility of the Levitical priesthood in declaring the “beginning of the months”, and Num 28 and 29 show the responsibility of the priesthood to perform sacrifices on the new moons and on the festivals. This evidence presented previously makes it clear that the priesthood controlled the calendar in the first century before the war broke out in 66.

The Jews began a war with the Romans in the year 66 and they were defeated in 70 when Jerusalem's walls were broken, the city was burned, and the Temple was burned and destroyed. Early in the war the Jews captured the southeastern fortress known as Masada at the top of a high plateau, and due to its natural protective position, the Jews defended this until 73 when the Romans scaled its walls and the Jews who were isolated there committed suicide.

The four most significant results of this devastating war were: (1) The anti-Jewish sentiment in the Roman Empire; (2) The destruction of the Temple, which was the Second Temple (the first Temple was Solomon's Temple); (3) The disappearance of the Levitical priesthood from known history not very long afterward; and (4) The opportunity for the victors of the political struggle between the Pharisees and the Sadducean priests to determine the general direction of written Judaism in later times.

The destruction of the Temple had significant consequences for Judaism. The Temple was much more than a physical structure. It was the symbol of the world headquarters of Judaism where Messianic rule was to occur. Pious Jews from many lands sent contributions there for the upkeep of the Temple and they sent tithe money to the Levitical priesthood. Many Jews traveled there three times each year for the festivals. When the Temple was destroyed, the physical symbol and the associated mental concept of Judaism were removed. It is to be expected that mental depression among many Jews continued for years, and they no longer had one primary place to visit for the festivals.

The Romans did not want the Temple to be rebuilt because in their eyes the zealous fanatical masses of Jews began the war from that focal point, the Jewish headquarters of Jerusalem. The loss of the Temple was a punishment, although the Jews maintained a hope that the Temple would be rebuilt just as the Second Temple replaced Solomon's Temple. The Romans no longer wanted to officially recognize any central body of Jews that represented the Jewish population, such as a Sanhedrin. In fact, since the Levitical priesthood did not prevent the war, the Romans had a negative attitude toward the priesthood, and they no longer officially recognized it as having authority in relation to the Roman governor and the other Jews in Judea. This meant that the only support the priesthood could get had to come from the Jews, not the Romans.

Before the war, the Roman government worked with the priesthood and recognized the priesthood. The priesthood had jurisdiction over the physical things of the Temple, and the Romans recognized this. The New Testament shows the Roman governor Pilate conversing with the chief priests (Luke 23:13). Pilate recognized their position of authority concerning the Jews, especially in the Sanhedrin and particularly the high priest. After the war, the Romans turned their back to the priesthood and gave it no recognition. This was only one of several heavy blows to the priesthood after the war.

The Temple at which they performed their rituals was gone, and although it was technically possible for them to imagine to perform rituals without a Temple as was done before Solomon's Temple was built, that would require money for their support such as tithe money, and it would require a Jewish audience that had a desire to watch them perform without the presence of the Temple. Note the reality seen from John 12:42, "... because of the Pharisees

they [the Jewish rulers] were not admitting, lest they [the rulers] should be put out of the synagogue [by the Pharisees].” This shows that the Pharisees had much control over the people in the synagogues. The synagogues were away from the Temple, but now there was no Temple. It is obvious that the priesthood would need the active support and cooperation from the Pharisees if they were to continue to perform their priestly rituals. That support would have to include the desire of the Pharisees to urge the people to send monetary contributions to the priesthood and to attend functions of the priesthood.

The authority of the priesthood came from the Tanak (the commanded function and respect indicated in Num 10:10; Deut 33:10; Num 28-29; etc.), partly from their genealogy, partly because of the desire of the Jews to watch them perform their duties, and partly from recognition by the Roman authorities. Any Pharisee who did not have the proper genealogy from Levi could not be a priest, and thus there was a barrier of lineage between most Pharisees and the priests. If the Pharisees were to encourage the people to give support to the priesthood, it would detract from their own authority.

Concerning the Sadducees, note Acts 5:17 [NKJV], “Then the high priest rose up, and all those who [were] with him (which is the sect of the Sadducees), and they were filled with indignation.” This shows the chief priests to be included within the Sadducees at that time, although it is unclear how many Sadducees might be from outside the priesthood. Acts 26 shows that there was doctrinal antagonism between the Pharisees and the Sadducees (largely the priestly party), which led to a physical tumult. Many places in the writings of Josephus show that there was political antagonism between the Pharisees and the Sadducees. This friction was due to the permanent gulf of genealogy, doctrinal differences in both details and overall approach, their different relationships with the Jews of the land (the ordinary people), and their separate association of friendships. In the Temple environment and with the Roman governor the Pharisees did not have the authority that they enjoyed in the synagogues. From this it should be clear that the Pharisees could not be expected to support the priesthood in the sense of urging the people to send them contributions and going to watch them perform their rituals. The loss of the priesthood from history is the clear evidence that the Pharisees let the priesthood vanish.

In Acts 15 and Gal 1:19; 2:9 James is mentioned. The death of this man James is described by Josephus in Ant 20:197-203. Page 32 of the article by

Smallwood states that the high priest Ananus mentioned in this episode had James killed in 62 CE, only four years before the war broke out. This episode is an instructive example that shows who had authority. On pages 495, 497 in Josephus_9, we see in Ant 20:199-203, “He [Ananus the high priest] followed the school of the Sadducees, who are indeed more heartless than any of the other Jews, as I have already explained, when they sit in judgment. Possessed of such a character, Ananus thought that he had a favourable opportunity because Festus was dead and Albinus was still on the way. And so he convened the judges of the Sanhedrin and brought before them a man named James ... [he was stoned] ... Those of the inhabitants of the city who were considered the most fair-minded and who were strict in observance of the law were offended at this. They therefore secretly sent to King Agrippa urging him, for Ananus had not even been correct in his first step, to order him to desist from any further actions. Certain of them even went to meet Albinus, who was on his way from Alexandria, and informed him that Ananus had no authority to convene the Sanhedrin without his consent ... King Agrippa ... deposed him from the high priesthood ...”

On page 26 Smallwood makes the following comment on this, “In doing so he [Ananus] acted *ultra vires*, and thus alarmed some of the more moderate Jews and ‘men learned in the law’ (i. e., the Pharisees) so much that they sent secretly to Agrippa ...” The point here is that the Pharisees were not able to prevent the death of James by the Sadducean high priest who was able to convene a Sanhedrin. It does show that while the Temple stood the Sadducees did have authority that the Pharisees could not overturn by themselves. It does cause me to believe that the passage quoted in a previous chapter in bold in Ant 18 describes the situation after the destruction of the Temple rather than before 66. Otherwise it would contradict the New Testament and the example of Ananus from Josephus.

In 93/94 when Josephus completed his *Antiquities*, it was about 23 years after the Temple was destroyed. This was sufficient time for the Levitical priesthood to crumble due to lack of funds and lack of backing by the Pharisees. In Ant 18 as quoted previously, we saw, “**yet submit they [Sadducees] do to the formulas of the Pharisees, since otherwise the masses would not tolerate them**”. In light of the New Testament this can only make sense after the Temple was destroyed.

Just as Josephus mentions the recent (near 93/94) domination of the Pharisees over the Sadducees without stating that it is recent, he also

mentions the Aries approximation for the first Jewish month without stating that it is recent!!

Before the Temple was destroyed in 70, Philo gave his view that the start of the first Jewish month should not come before the vernal equinox. After the Temple was destroyed, Josephus's approximation using Aries allows the first Jewish month to begin about three weeks before the vernal equinox. This provides indirect evidence that the Pharisees altered the calendar after the Temple was destroyed and the Sadducees were deprived of their authority.

Gen 1:14 provides a very general statement that the heavenly bodies, or lights in the sky, determine the calendar. We have seen from Isa 47:13 that the beginning of the month, *chodesh*, was conceptually the same in the Babylonian calendar and in Israel's calendar. We have seen the use of the Babylonian month names by Ezra and Nehemiah in the context of Jerusalem in the fifth century BCE, which shows that in order to avoid confusion within that empire, the first month in both calendars should almost always be expected at the same time, with perhaps a day's difference on some occasions. The Babylonian calendar began its first month in the fifth century BCE, the century of Ezra and Nehemiah, so that the new crescent that was seen on or first after the vernal equinox began the first month of the year. We have seen that this biblically based evidence that is correlated with primary archaeological evidence of astronomy from the ancient Babylonians provides simple astronomical rules for the calendar. Philo of Alexandria provides written corroborating evidence from the first century before the war in 66 that these simple astronomical principles guided the calendar in the early first century.

In contrast to the above simple astronomical principle, the method to determine the first month according to Rabbinic literature is described in subjective terms with differences of opinion, thus leaving the reader with uncertainty and confusion. From simplicity before the destruction of the Temple, we find ambiguity and the need for subjective judgments later. These elusive principles involve weighing a combination of factors such as the state of the barley, the time of the vernal equinox, the state of the fruit trees, and even the development of the wings of young pigeons. The location of these phenomena within Israel are also relevant in the Rabbinic sources. One would have to conclude that knowledge of when the first month should occur became lost sometime after 70.

The Aries approximation by Josephus is not so much a black mark against Josephus as it is a black mark against changing practice by the Pharisees in their struggle with the Sadducees. Josephus is merely reporting on the practice of when the first month has been falling in recent years.

The logical explanation is that after the Temple was destroyed, there was a doctrinal difference over the method to determine the start of the first month. This difference would be between the leaders of the priests and the non-priestly leaders who had authority among Jews, i. e., the Pharisees. It is reasonable to think that there was a power struggle between the priests and the non-priestly Jewish sages, and the calendar became an issue in this struggle. The method to properly determine the first month was lost within subsequent Jewish writings. No doubt this happened soon after the Temple was destroyed when a struggle for authority would be natural. No written records describe it. Eventually the news filtered down to Josephus in Rome where he lived. From synagogues in Rome, Josephus had to notice that the first Jewish month was no longer falling where it had been falling before the Temple was destroyed. If the primary audience of Josephus, the Roman nobles who prized the Greek language, wanted to know when the first month of the Jewish calendar fell, what would Josephus tell them? Would he tell them of a recent power struggle among Jews and a change in the placement of the first month? Certainly not! The Jews would not want to inform Josephus of their internal problems because they considered him to be a traitor due to his role in the war after he surrendered. Josephus would want to supply his readers with an approximation to the current practice of the Jews, not what had been the practice before the Temple was destroyed.

Josephus was a very practical person subject to biases as a politician, certainly not an idealist in truth. Josephus is not a good source to know when the first month fell before the Temple was destroyed because he wrote after it was destroyed and after the leadership of the greater mass of Jews in greater Judea changed. The Aries approximation was a poisoned pill of deception for the future of calendar study.

[76] The Easter Calendar Deception from Josephus

On the 400th anniversary of the proclamation of the establishment of the Gregorian calendar, a conference was held and jointly sponsored by the Pontifical Academy of Sciences and the Pontifical Vatican Observatory in Rome. Several papers that were presented at this conference in 1982 were

authored by historians of astronomy. These papers were published in one volume in 1983. Olaf Pedersen and John D. North authored two of these papers, and they will be quoted below.

On pages 30-31 of Pedersen 1983 we note, “There is no doubt whatever that the only place where these [mathematical calendric] problems [to determine the first month for the Church] could be properly tackled was Alexandria, the intellectual capital of the Hellenistic world where there was, all through the first Christian centuries, a competent school of astronomers and experts in time reckoning. Its best known representatives were the non-Christian scholars Ptolemy in the second and Theon on the fourth century. We do not know whether the Metropolitan Bishop of Alexandria consulted these experts. But it is certain that the Early Church in many places looked to Alexandria as the city where information about Easter could be obtained. In the third century we hear of Alexandrian bishops sending letters to other Churches before Easter, announcing the date on which the feast was going to be observed in Alexandria. This was the case of Bishop Demetrius (d.c. 232) who wrote such Pashal letters to the bishops of Rome, Antioch and Jerusalem, and also of Bishop Dionysius the Great (d.c. 264) who wrote to the otherwise unknown Flavius, Domitius and Didymus, presumably suffragan bishops in Egypt. This custom prevailed long after the Easter problem had been settled, and the universal practice of bishops sending pastoral letters to their clergy during Lent is a direct outcome of the dependence of the Early Church on Alexandria for obtaining information on Easter.”

On page 31 Pedersen wrote, “... spring begins at the vernal equinox which the Alexandrians placed on March 21 (in the Julian calendar).” On page 31, “The earliest indication of how the Alexandrian Church went about this business is found in Eusebius’s account of Dionysius’s letter to Domitius and Didymus in which he *published an eight year Easter Canon at the same time as he stated that Easter should never be celebrated until after the vernal equinox* [Eusebius’s Ecclesiastical History 7:20].”

This above rule from c. 250 allows Nisan 1 to occur about two weeks before the vernal equinox. From this we see that 75 years before the Council of Nicea in 325, there was already an established tradition of when to determine the first month based on reckoning from Alexandria, which placed the vernal equinox on the first day of Aries, March 21, instead of on the eighth day of Aries according to the practice in first century Rome from

which Josephus wrote. In other words, scholars from Alexandria (such as Anatolius, who died c. 282) who read the Aries approximation by Josephus would understand Josephus differently from how Pliny the Elder would understand it because they would interpret the beginning of Aries differently. The Council of Nicea did not have the purpose to determine when to begin the first month because it had already had a tradition from Alexandria.

The Easter rule using the full moon was a corruption (an incorrect understanding, much worse than an mere approximation) of what Josephus meant in his context of Rome compared to Alexandria where the beginning of Aries began differently. Thus the astronomically awkward Aries approximation in first century Rome was transformed into a full moon rule from later Alexandria, which the Council of Nicea accepted from Alexandrian Church tradition. Those from Alexandria misinterpreted the meaning of Aries from Josephus in Rome, and they also neglected to consider the hidden matters of the rivalry between the Pharisees and the Sadducees. They did not realize how that rivalry finally led to Jewish confusion concerning the beginning of the first month.

John North 1983 provides a literal translation of the rule for determining Easter on page 76 as follows, “As for Easter, the rule finally agreed was that it must be celebrated on the *Sunday next after (and not on) the 14th day of the Paschal moon, reckoned from the day of the new moon inclusive. The Paschal moon is the calendar moon whose 14th day falls on, or is the next following, the vernal equinox, taken as 21 March.*”

John North’s phrase “calendar moon” means an approximately computed lunar month. His phrase “Paschal moon” means Easter month. Note that the full moon is not explicitly stated here because the full moon is accepted to be on the 14th day of the lunar month; thus the full moon is there in a disguised form. North’s mention of the new moon is not the observed new crescent, but some cyclical pattern that approximates the observed new crescent. March 21 was a date of the Julian calendar, which was an approximation to the vernal equinox. Since the Julian calendar’s year was slightly longer than a true tropical year, over the centuries March 21 in the Julian calendar became much later than the true vernal equinox. That led to the replacement of the Julian calendar with the Gregorian calendar in 1582, so that March 21 would be a good approximation to the vernal equinox.

This rule of Easter for the Roman Catholic Church originated from bishops in Alexandria. It took a few centuries before uniformity over the precise method became standardized.

When the church historian Eusebius wrote about the time of the first month in relation to observing *pascha* (this is the Greek transliteration for Passover / Easter), he reserved detailed space to Anatolius alone. Anatolius wrote an essay in Greek concerning the time for observing the *pascha*. The original Greek version no longer exists, but this was translated into Latin under the Latin title *De ratione paschali* (*About the Reasoning of Passover*). The Latin text survives in eight hand-written manuscripts. This essay was translated from Latin to English based upon only one of the eight manuscripts by S. D. Salmond and published in 1926. Anatolius wrote this c. 270. He spent his early life in Alexandria where he was educated, although he became the bishop of Laodicea. Some sources call him Anatolius of Alexandria, and others call him Anatolius of Laodicea.

Daniel P. McCarthy and Aidan Breen wrote a definitive book on the essay on Passover by Anatolius and this makes the translation by S. D. Salmond obsolete.

The question arises concerning the reliability Anatolius and especially some of his claims. For this purpose one must consider his entire essay on the Passover rather than merely the extract that Eusebius quoted.

[77] Introduction to *aviv* and *chodesh ha aviv*

A. The First Month correlates with Standing Grain of Barley

There is an annual agricultural cycle in Israel that depends on nearly consistent annual weather conditions, especially of heat from the sun, rain patterns, and cloud conditions in the various parts of Israel. There is also an annual pattern of numbering the biblical months beginning with one and ending with 12 or 13. The purpose of this chapter along with several chapters to follow is to examine what Scripture says about the correlation between the annual agricultural cycle and the numbering of months, especially the first month.

The commanded festivals for holy convocations are associated with certain agricultural phenomena. This introductory chapter will briefly touch on

certain common threads to establish only limited agricultural conclusions, including some concerning the wave sheaf offering. Later, some of these threads will be discussed again in much greater detail. Certain relevant verses from the Tanak have technical Hebrew words for which different translations differ, and it takes effort to avoid getting bogged down in too many details in this introductory chapter. In recognition of this potential problem in getting bogged down at this early stage, certain Scriptures will be mentioned but not be translated here. In some cases only a phrase from a verse will be presented rather than the entire verse. The goal here is an introductory framework that outlines the issues and directions for later study rather than providing all the details.

After mentioning the seven Days of Unleavened Bread in Lev 23:6-8, verses 9-16 pertain to a commanded ceremony involving the Israelites along with the priesthood that is often called the wave sheaf offering. Verse 16 mentions a count of 50 days from the day of this wave sheaf offering, and verse 21 declares this 50th day to be a day of holy convocation. Deut 16:9-10 mentions a count of seven weeks, which is 49 days, culminating with the Feast of Weeks. Num 28:26 states that the Feast of Weeks is a day of holy convocation. By correlating these matters it becomes clear that the unnamed day of the holy convocation on the 50th day in Lev 23:21 is the Feast of Weeks. Hence Deut 16:9-10 is an outlined summary of matters that lead into the Feast of Weeks.

Deut 16:9 mentions “sickle to the standing-grain”, where *standing-grain* is a translation of the Hebrew word *kamah*, which is Strong’s number 7054, and is found on page 879 of BDB. It is instructive to note the context of *kamah* in another verse that also contains the same Hebrew word for “sickle”, although the entire phrase is not identical in the Hebrew in these two verses from Deuteronomy. Deut 23:25, “When you go into the standing-grain [= *kamah*] of your neighbor, then you may pluck the grains with your hand, but you shall not put the sickle on the standing-grain [= *kamah*] of your neighbor.” This word *kamah* occurs 10 times in the Tanak. It refers to mature grain three times: Deut 23:25 (twice); Is 17:5. It refers to immature grain three times: II Ki 19:26; Is 37:27; Hos 8:7. In four cases its stage of growth is not indicated from its own immediate context: Ex 22:6; Deut 16:9; Judg 15:5 (twice).

In Deut 16:9 the relationship between the phrase “sickle to the standing-grain” and the wave sheaf offering from Lev 23 is not stated. However, since

Deut 16:9-10 is an outlined summary of matters that lead to the Feast of Weeks, it may at least be inferred that the tool called the sickle is used to cut down some standing-grain, and that this cut down standing-grain from Deut 16:9 is the agricultural item that is ultimately involved in the wave sheaf offering. This will be explored in greater detail later. The limited conclusion at this time is simply that the agricultural item of interest in the wave sheaf offering comes from cut *standing-grain*. The stage of growth of this standing-grain is not indicated in the summarized context of Deut 16:9-10, and this question remains to be explored later.

One paramount question concerning Deut 16:9 is whether any usage of this cut standing grain beyond that of the wave sheaf ceremony can be demonstrated from the related context of Lev 23:9-16. Technicalities of Lev 23:10 must be discussed. Care must be taken to avoid making assumptions for which there is no evidence. The reason for raising these questions is to discover whether there is any evidence concerning the degree of maturity of this cut standing-grain for the wave sheaf offering. There is nothing in the context of Lev 2:14-16 to show that it refers to the wave sheaf offering or even that it pertains to only one kind of grain. At this time the question concerning the precise content of the wave sheaf offering and further exploration of the depth of Deut 16:9-10 is postponed until later. The word *sheaf* that occurs in many translations in Lev 23:10, 11, 12, 15 is the Hebrew word *omer*. The priest waves or lifts up the *omer* when performing the wave sheaf ceremony. Obviously there must be standing grain for this to happen, and this is the first month according to Lev 23:5-21.

The single Hebrew word for “unleavened bread” is *matsot*, which is Strong’s number 4682. This word occurs in Lev 23:6 and Num 28:17 where both of these verses show that the 15th day of the first month is the first day of the Feast of Unleavened Bread. Ex 12:15 explicitly states that the Israelites were to eat *matsot* for seven days, and verse 18 takes care to specify that this period of eating *matsot* is from the end of the 14th day through the end of the 21st day. Deut 16:3 refers to *matsot* as “bread of affliction”, so that the normal Hebrew word for bread also applies to *matsot*. Lev 23:14 commands that until the wave sheaf offering has been performed, various forms of grain products, including bread (this includes *matsot*), must not be eaten by the Israelites. Since *matsot*, a form of bread, must be eaten from the end of the 14th day for seven days, thus including the 15th day, how can Lev 23:14 forbid the eating of bread until the wave sheaf offering has been performed? The answer to this apparent contradiction is that in verse 14 it must be

understood that grain products are forbidden to be eaten from the *new crop* of grain until the wave sheaf offering is performed. The people were not forbidden from eating grain products from the previous year's crop. Thus *matsot* may be eaten for all seven days from the previous year's crop.

What type of grain is involved in the wave sheaf offering? There is no direct statement about this in the Tanak, but there is clear indirect evidence from Lev 23:10, 14. Lev 23:10 concerns some technical details that are postponed until later, so verse 14 will be discussed now. Since Lev 23:14 forbids the eating of grain products from the *new crop* of the land until the wave sheaf offering, this implies that the first species of grain that ripens is the crop most affected by this prohibition. II Sam 21:9 says, "... in the days of harvest, in the first days, at the beginning of the barley harvest". Here some translations have the second use of the word "days" in italics, indicating it is not in the Hebrew. The Hebrew word translated "first[day]s" is *reeshneem*, the masculine plural form of *reeshon*, Strong's number 7223, found on page 911 of BDB. The Hebrew word for "days" is also masculine plural, so that the word "days" is implied yet absent. This verse is clarifying that the beginning of the grain harvest is when barley is reaped. This shows that barley is the first major crop to be reaped when the weather is warming after the cold of winter, although any full study of agriculture in Israel would reveal this. The wave sheaf offering must pertain to barley because it is the first grain crop to ripen. Ruth 1:22 ends with "... at the beginning of the barley harvest". The Hebrew phrase used here in Ruth also appears at the end of II Sam 21:9. Ex 9:31-32 also shows that barley matures before wheat and spelt.

Obviously there is some correlation between the first biblical month and the presence of standing grain of barley in Israel. There is a need to explore the nature of this correlation. How precise is the correlation?

B. Three Questions about *aviv* including the Hebrew Grammar

Lev 23:6 shows that the Feast of Unleavened Bread occurs in the first month. Ex 34:18 reads, "You shall keep the Feast of Unleavened Bread. Seven days you shall eat unleavened bread as I commanded you at the appointed time [in] *chodesh ha aviv*, because in *chodesh ha aviv* you went out of Egypt." Num 33:3 states that the Israelites set out from Rameses in Egypt on the 15th day of the first month. As previously discussed, *chodesh* may mean "month" or "new moon", depending on the context. Here it must

mean “month” because the Feast of Unleavened Bread begins on the 15th day of the first month according to Lev 23:6 and Num 28:17. One matter is now obvious: the Hebrew word *aviv*, having Strong's number 24, is associated with the first month. We have also seen that standing grain of barley is associated with the first month.

Having introduced the phrase *chodesh ha aviv* from Ex 34:18, three separate questions now arise: (1) What does *aviv* mean? (2) What does the expression *chodesh ha aviv* mean? (3) What is the significance of the grammar in this expression with the Hebrew word *ha* between *chodesh* and *aviv*? The word *ha* means “the”. Some Hebrew expressions have *ha* where the English does not have “the”, and some English expressions have “the” where the Hebrew does not have *ha*. Care must be exercised when attempting to draw conclusions from this, but there is definite evidence available concerning this third question.

Consider the first question: What does *aviv* mean? After having examined many biblical Hebrew lexicons and commentaries, I find that among scholars there is a difference of opinion concerning the meaning of *aviv*. Some lexicons give the flavor of meaning that it refers to ears of grain that are not yet fully ripe. In this context the word “ear” refers to the head or the single grain. Two examples follow. BDB page 1 gives the meaning, “fresh, young ears of barley”. HALOT page 4 states, “ears (of corn [= grain]) already ripe, but still soft, to be eaten either crushed or roasted”. Other lexicons also give the meaning of “ear of grain”, but refuse to narrow the meaning any further. Two examples follow. On page 227 of the article numbered 26 “*aviv*” authored by Paul Wegner 1997, he gives the meaning, “ears of grain”. DCH only uses all sources of ancient Hebrew texts that were composed before the *Talmud* (the first part of which is called the *Mishnah* c. 200) in order to arrive at its meanings. On page 103 of DCH the meaning of *aviv* is “ear (of cereal)”, and one context it cites for the use of *aviv* is from “The Temple Scroll” (abbreviated 11QT) 19:7 where it gives the translation “new bread (made of) ears of various cereals”. Here the plural of *aviv* is translated “ears” and implies that the ears were ground into flour in order to make bread. This example of the use of *aviv* from before the first century shows that the range of the meaning of *aviv* extends to being sufficiently ripe so as to be able to make flour. “The Temple Scroll” is found among the Dead Sea Scrolls and most estimates date it to roughly 150 BCE. Another lexicon claims that the word *aviv* does imply “ripened”. The encyclopedia

article titled “ABIB” authored by Walter Kaiser 1975, gives the meaning, “ripened head of grain” on page 11.

The fact that scholars disagree on the meaning of *aviv* does not mean that a full study of this matter will fail to reach a convincing conclusion! This should at least convince the reader that simply relying on any opinion without solid evidence is folly.

The word *aviv* occurs eight times in the Tanak. In six of the eight places this occurs in the expression *chodesh ha aviv*. These six places are Ex 13:4; 23:15; 34:18 (twice); Deut 16:1 (twice). The context of these six places does not help to pin down the meaning of *aviv*. The other two places, Ex 9:31 and Lev 2:14, are extremely important, and these will be examined in great detail later. The Greek translation from the Hebrew known as the Septuagint, or LXX for brevity, was made before the first century, and this can be helpful as a witness to see how the translators understood *aviv*. The single example seen above from the Dead Sea Scrolls should also be taken into consideration because Hebrew was still a living language at that time, and it does provide one context, yet it is of somewhat lesser significance than Ex 9:31 and Lev 2:14. The path set before us for the next several chapters concerns these factors that provide evidence for the meaning of *aviv*, as opposed to opinion.

The second question concerns the meaning of the expression *chodesh ha aviv*, but an understanding of this must await the discovery of the meaning of *aviv* as well as the third question. The third question concerns three choices or hypotheses, and this is taken up next.

C. Three Hypotheses on the expression *chodesh ha aviv*

The third question concerns the significance of the grammar in the expression *chodesh ha aviv*, especially focusing on the middle word *ha*, meaning “the”. This third question will now be considered. For this third question, three different possible proposed choices or hypotheses are now presented concerning the expression *chodesh ha aviv*.

(i) This choice is the pure description hypothesis. This proposal claims that the meaning of *aviv* is sufficiently precise that the first place (in time) within the biblical borders of Israel that satisfies the definition of *aviv* causes the next month to qualify as the first month of the biblical year. In this

hypothesis barley is involved and the natural conditions of temperature and water supply are not to be distorted for the evidence to be admitted. This pure description hypothesis claims that *aviv* is not a name, but is instead a precise description that uniquely determines the first month. Some promoters of this hypothesis may also claim that the middle word in the expression *chodesh ha aviv* is conclusive evidence from Hebrew grammar that the description in the definition of *aviv* must be so precise that no other candidate month could qualify as the first month.

(ii) This choice is the abstract name hypothesis. This proposal claims that regardless of what *aviv* means, the significant use that *aviv* has in the expression *chodesh ha aviv* is merely to abstractly label the month with a name rather than to insist that the meaning of *aviv* is significant in the expression.

(iii) This choice is the descriptive name hypothesis. This proposal claims that the use of *aviv* within the expression *chodesh ha aviv* serves the dual purposes of being a name (as a label) and also having a meaning related to the context of the first month. This choice avoids the need to require that *aviv* has such a precise meaning that its meaning alone identifies one and only one month. A biblical name frequently has meaning. For example, the name Isaac, in Hebrew *Yitschak*, means “he laughs”. Note the meaning from the context in Gen 17:17-19 where Abraham laughed.

D. Solution to the Grammar Question in the expression *chodesh ha aviv*

Consider now the significance of the grammar involving the middle word *ha* in *chodesh ha aviv*. Is there any other biblical month that is identified with a word (not a number) for which the Hebrew word *ha* appears before the word? I Ki 8:2 states, “And all [the] men of Israel were assembled toward the King Solomon in *yerach ha etanim*, which [is] the seventh the month [= *chodesh*] at [the] feast.” Consider the following comments concerning I Ki 8:2.

(1) Note that this very literal translation takes painstaking care with the Hebrew word *ha* and the English word “the” so that whenever the Hebrew has *ha*, the English translation has “the”, and whenever the English would normally use “the” but the Hebrew does not have *ha*, square brackets are used to show the need to supply “the”. This illustrates the inconsistency between English and Hebrew concerning the use of the word “the” and *ha*.

Much caution is needed before jumping to conclusions involving the presence or absence of *ha*.

(2) Note that the expression *yerach ha etanim* is typically translated “month of Ethanim”, omitting the word *ha* in translation. The word *yerach*, Strong’s number 3391, means “month”, but *chodesh* is used far more frequently. The use of *yerach* was discussed in a previous chapter. The word *etanim* has Strong’s number 388. In the commentary for I Ki 8:2 on page 193 of Gwilym Jones 1984 we read, “... the name [Ethanim] is connected with a root meaning ‘always filled with water’...” On page 82 of Norman Snaith 1947 he gives his opinion, “This makes Ethanim to be the month when only the most stubborn streams continue to flow. It is the last period of the summer drought, before the former rains begin.” Further remarks on the grammar of *ha* in the expression *yerach ha etanim* will be discussed below.

(3) In an early chapter it was mentioned that Abraham’s native language was Akkadian, but when he arrived in the land of Canaan, he encountered the Ugaritic language, or perhaps a slight variant of Ugaritic. Abraham’s later years as well as Isaac’s life and Jacob’s life primarily involved contact with the language of the Canaanites, a variant of the Ugaritic language. Ancient Hebrew is very similar to Ugaritic and many Hebrew words of a technical nature are from Ugaritic. The Canaanites also used a lunar calendar that attached certain words or names to certain months in an annual pattern. Not enough archaeological information about the Ugaritic language is known to establish month names for all months, and even the order of month names that have been found is a matter of conjecture. It is not known whether there was a very precise rule to determine the placement of the month names among the Canaanites. The word *aviv* has not been found in Ugaritic, but since our current knowledge of ancient Ugaritic is not complete, it is possible that the word *aviv* was used among the Canaanites (page 44 of William Propp 1999). The month Ziv appears in I Ki 6:1, 37 and the month Bul appears in I Ki 6:38. The month names Ethanim, Ziv, and Bul have been found in Ugaritic or Phoenician. At the time in biblical history that these names occur in I Kings 6 and 8, King David had conquered the Canaanites, so the Canaanite month names were not a source of competition or confusion within Israel.

We possess two archaeological examples of the use of Ethanim (*etanim*) outside the Tanak. On the island of Cyprus a Phoenician document was found with the expression *yerach etanim* (page 421 of Mark Lidzbarski). In

a Ugaritic document from an area where Lebanon is today, the same expression *yerach etanim* (document 37A: page 8 of Donner and Rollig 1979, and page 54 of Donner and Rollig 1968) also occurs. In both of these non-biblical examples the word *ha* does not occur. This implies that ancient Israel added the word *ha* in the expression *yerach ha etanim* where *ha* did not occur in Ugaritic or Phoenician. Hence this expression from I Ki 8:2 should not be considered a mere copy of a Canaanite expression as though it had no significance in the ancient Hebrew language. The only known examples of the Hebrew *ha* before a month designation are for *aviv* and *etanim* in early ancient Israel. These are the first and the seventh months, which are unique in that they contain the major festivals. There may be a cultural reason associated with the festivals that motivated ancient Israel to place *ha* before these month designations.

(4) If the use of *ha* were to **grammatically force** a highly specific characterization or description in the expression *chodesh ha aviv* that would always force one and only one month to be determined through the meaning of *aviv*, then the same claim should prevail concerning the expression *yerach ha etanim*, an expression that is unique to ancient Hebrew, differing from the Ugaritic and Phoenician. The meaning of *etanim* as given above in (2) is a reasonable assertion according to several sources, but confidence in this is not nearly certain. The word *aviv* is used for the first month and the word *etanim* is used for the seventh month. Therefore, there are always exactly five months between them. But it does not make sense to imagine that a meaning from nature (agriculture or weather) that supposedly precisely and uniquely identifies two months will necessarily always have exactly five months between them, from month one to month seven. Therefore the alleged argument **from grammar alone** that *chodesh ha aviv* must be a very specific description that itself determines the first month is incorrect. Of course it still remains to be seen if other evidence (not grammatical) to be discussed later is able to force a highly specific meaning to *aviv* that would require exactly one month to be identified based upon its meaning and use. Footnote 1 on page 926 of August Dillman 1882 states the following in my literal translation from his German, “In the OT it is verified that *aviv* is only joined with the [definite] article [*ha*] and only with *chodesh*, also its meaning is perfectly clear, not hidden, that it was also certainly to be understood [for the] month name; the situation is nothing different from use with *etanim*.”

Most of the questions that have been raised still remain to be answered. However, a clarification of the issues has been attained. We know that *chodesh ha aviv* refers to the first month. We know that the presence of the middle word *ha* does not have significant grammatical consequences. We know that standing grain of barley is involved with the wave sheaf offering, which occurs during the first month. For the meaning of *aviv*, key explorations remain concerning Ex 9:31-32 and Lev 2:14-16, and also the Septuagint. Simply citing opinions for the meaning of *aviv* will not prove anything. The wave sheaf offering concerning Deut 16:9-10 and Lev 23:9-16 remains to be discussed in more detail.

[78] Genetics of Barley

Concerning the genetics of the earing of barley, page 149 of Nilan states, “The inheritance of the time of heading in barley ranges from fairly simple to very complex. Several reports have indicated a 3:1 segregation ratio with early (Doney 1961; Gill 1951; Grafius, Nelson, and Dirks 1952; Murty and Jain 1960; Ramage and Suneson 1958; Scholz 1957) or late (Bandlow 1959; Frey 1954a; Scholz 1957) being dominant. Two-factor pair inheritance was reported (Frey 1954a) with late dominant to early. Fiuzat and Atkins (1953) found that the date of heading in two crosses appeared to be controlled by a single major gene pair plus modifying factors, an indication of some of the complexities of the inheritance of this characteristic. Yasuda (1958) reported on two-factor pairs responsible for the difference between early and late varieties. He labeled the genes 'AA' and 'BB' with 'AA BB' varieties 60-days earlier than 'aa bb' varieties. Each allele appeared to be additive, and no interaction between genes in the F1 hybrid was noted.”

The point here is that different varieties of barley behave differently with regard to reproductive timings. Presumably, if farmers planted one variety of barley as opposed to another in the appropriate place, this could make a significant difference in the time of the ripening of barley in Israel when viewed as a whole. This also makes it hazardous to make general precise statements about the time of the ripening of barley.

[79] Stages in the Development of an Ear of Barley

The journal article by Zadoks and others presents a list of distinctly definable stages in the development of a grain of cereal. In the botanical terminology of cereal crops the word “caryopsis” refers to the grain. On

page 418 all of the distinct stages of the caryopsis are segregated into three broad phases in the order of timing: (1) Milk Development; (2) Dough Development; and (3) Ripening.

Milk development consists of the following four stages: caryopsis water ripe, early milk, medium milk, and late milk.

Dough development consists of the following three stages: early dough, soft dough (finger nail impression not held), and hard dough (finger nail impression held).

Ripening consists of the following four stages: caryopsis is hard and difficult to divide by the thumb-nail, caryopsis is hard and can no longer be dented by the thumb-nail, caryopsis is loosening in the daytime, and over-ripe (straw is dead and grain is collapsing).

The above classification defines eleven stages. The time for each stage depends upon the specific species of crop (for example barley, wheat, and buckwheat), the variety of each crop (genetics plays a role), and how rapidly the heat rises from day to day in the area of that crop. In the warmest areas where the temperature changes the slowest from day to day, these eleven stages may take about three months for certain varieties of winter barley. In the coldest areas having latitudes far away from Israel where the temperature warms very quickly from day to day, all stages may only take about one month.

[80] Firstfruits and the Hebrew words *bikurim* and *raysheet*

The word *aviv* is found in Lev 2:14, and this highly significant verse also contains the word firstfruits [1061 *bikurim*]. Before discussing Lev 2:14 in depth, it is beneficial to discuss *bikurim* because it helps to provide more context to Lev 2:14 and it will be useful later. This word occurs 17 times in the Tanak, always in one of the two plural forms, *bikurim* or *bikuray*. In eleven of these 17 times it relates to an offering that was to be brought by the Israelites to the priesthood (Ex 23:19; 34:26; Lev 2:14, 14; 23:17, 20; Num 18:13; Neh 10:35, 35; 13:31; Ezek 44:30). In these eleven contexts this word is generally and consistently translated “firstfruits”, and this is not a controversy. The other six places where *bikurim* occurs are Ex 23:16; 34:22; Num 13:20; 28:26; II Ki 4:42; Nah 3:12.

One instructive context is Num 13:20, “And how [is] the land, [is it] fat [= rich] or lean [= poor], does it contain wood or not? And strengthen yourselves and bring of the fruit of the land. Now these days [were the] season of [the] first-ripe [= *bikurim*] grapes.” Grapes are ripe in Israel from about early August to the middle of November, a stretch of at least three months. This is too long for the entire period to be meant as a specific time reference in Num 13:20. The context here implies some specific agricultural description of the time of the year concerning grapes. Since the basic meaning of this word concerning an offering is “firstfruits” the word *bikurim* means “first-ripe” in Num 13:20. Another corroboration of this is Nah 3:12, “All your fortifications [are] fig trees with ripe-fruit [= *bikurim*]; if [they are] shaken they will fall into [the] mouth of an eater.” Only ripe fruit will fall from a tree when the tree is shaken. Thus the meaning is “ripe-fruit” here. These examples using grapes and figs show that the word *bikurim* implies ripeness. With grapes and figs ripeness is a synonym for usefulness for human consumption.

Another significant verse containing *bikurim* is II Ki 4:42, “Then a man came from Baal-shalisha and brought to [the] man of the Almighty bread of firstfruits [= *bikurim*], 20 loaves of barley, and fresh-grain encased [= in husks]”. The significance of this verse lies in the fact that bread was made from barley that is called firstfruits (*bikurim*). This shows that the barley that is called firstfruits can be fully ripe so that flour may be made from it. The word *bikurim* does not have to imply that the barley is less than fully ripe, though it may be less than fully ripe, and this will be explored further shortly. The above translation at the end of II Ki 4:42 is not relevant to the purpose of understanding *bikurim*. However, any interested reader who desires to know my motivation for translating the ending that way may consult pages 109-111 of Margalit 1984, pages 389-392 of Margalit 1989, and page 118 of Loewenstamm 1975.

II Ki 4:42 is an example of the use of *bikurim* in which it was given to the prophet Elisha rather than a priest. In the following five places *bikurim* is associated with the Feast of Weeks, also called Pentecost: Ex 23:16; 34:22; Lev 23:17, 20; Num 28:26.

We have seen above that grain called firstfruits (*bikurim*) may be fully ripe so that flour and bread may be produced from it. Now we consider the question of how early a stage in the development of grain it may be considered firstfruits. We have seen above that the word *bikurim* implies

ripeness as it was used in the context of grapes and figs. These fruits are considered ripe based upon certain taste characteristics and usefulness for human consumption.

Now consider grain. In the context of walking through the grainfields, Luke 6:1 states, “His disciples plucked the heads of grain and ate them, rubbing them in their hands.” In what stage of growth was this grain? In a previous chapter titled “Stages in the Development of an Ear of Barley”, three broad phases in the following order were listed: (1) Milk Development; (2) Dough Development; and (3) Ripening. The disciples were eating the grains raw and were apparently comfortable doing it. Thus the grains were soft or milky, not yet ripe in the sense of the modern agricultural classification. Since the stage of development of these grains made them suitable for human consumption, they could qualify as suitable for a firstfruits offering. Scriptural ripeness for *bikurim* is not the same as the modern agricultural concept of ripeness for commercially reaping fields of grain. Ancient farmers would not want to begin their general reaping until the grain crop was advanced enough to make flour. Thus the grain offering of firstfruits to the priesthood could precede general reaping or wait until general reaping.

In footnote 60 on page 44 of H. L. Ginsberg 1982 we find, “In [Dalman, Vol. 3, 1933] p. 1, Dalman notes that the change from soft-seeded ears to fully ripe ones is marked by a change in the color of the standing grain: barley turns from green to yellow; in wheat, the green fades to a shade that is so light as to be almost white. I have learned further from competent informants in Jerusalem that during the green phase of the standing grain the seeds in the ears are likewise green and that if they are pressed liquid will ooze from them, for which reason this stage is called *havsalat halav*, literally ‘milk ripening,’ in *Ivrit* [= Hebrew]. It is this term that has inspired my own coinage milky grain.” Next Ginsberg states, “Of course milky grain, though it cannot be ground to flour, is not unsuitable as food.” It is possible that most of the grain in Luke 6:1 was milky grain.

This milky state of barley is the first of the three major phases of its development. It shows that the firstfruits offering of barley may occur soon after the earing has begun.

In five of the 17 contexts with *bikurim* (Ex 23:19; 34:26; Num 18:12-13; Neh 10:35-37; Ezek 44:30) another Hebrew word, *raysheet* occurs, which has a greater variety of meanings. Strong's number 7225 is assigned to

raysheet. Translations of *raysheet* sometimes differ from one another, even in the same verse. These five contexts all involve an offering by the Israelites to the priesthood of valued items that originate, directly or indirectly, from life that comes forth from the earth. Our goal now is to study the meanings of *raysheet*.

When a fine point of the law of Moses is under discussion in a translation of the Tanak where many contexts are involved, it is generally safer to consult a committee translation made by Jewish scholars because in a multitude of counsel there is wisdom, and because Jews would be more sensitive to fine points of the law than others. Two recent committee translations by Jewish scholars are Tanakh-JPS and Tanach-Stone. The former of the two had contributors from all branches of Judaism, while the latter is an Orthodox rabbinic work that was influenced by Jewish sages of the past. In all contexts for *raysheet* I looked at both of these translations, and occasionally I looked at other translations. I also consulted some commentaries and lexicons.

The Hebrew word *raysheet* occurs 51 times, and I have split them into six groups. Only the second and third groups involve the priesthood. In the first group of 19 places *raysheet* means “beginning”: Gen 1:1; 10:10; 49:3; Deut 11:12; 21:17; Job 8:7; 42:12; Ps 111:10; Prov 1:7; 4:7; 8:22; 17:14; Eccl 7:8; Isa 46:10; Jer 26:1; 27:1; 28:1; 49:34; Micah 1:13. In the second group of eleven places the priesthood is involved and the meaning of *raysheet* is perhaps subjective, and its translation often varies: Lev 2:12; 23:10; Deut 18:4, 4; 26:2, 10; II Chr 31:5; Neh 10:37; 12:44; Prov 3:9; Ezek 20:40. In the third group of eight places the priesthood is involved and *raysheet* means best/choicest or first: Ex 23:19; 34:26; Num 15:20, 21; 18:12; I Sam 2:29; Ezek 44:30, 30. In the fourth group of six places *raysheet* means best or leading or finest: I Sam 15:21; Jer 49:35; Ezek 48:14; Dan 11:41; Amos 6:1; 6:6. In the fifth group of six places *raysheet* means first (though there might be some dispute in Jer 2:3): Num 24:20; Job 40:19; Ps 78:51; 105:36; Jer 2:3; Hos 9:10. The sixth group has only Deut 33:21 where the meaning may either be best or first.

The common concept that unites all six groups that represent *raysheet* is “first” in the sense that it may mean first in time, first in quality, first in prominence, first in strength, or first (in quality or time) from a crop or a product from a crop, where that small amount is to be presented to the priesthood. In contrast to this, the word *bikurim* primarily means “firstfruits” in the sense of an offering presented to the priesthood, yet there are some

exceptions in its use, especially with regard to the Feast of Weeks. However, even when the latter feast is involved, the firstfruits (*bikurim*) of wheat is in mind (Ex 34:22), so that it may be argued that associations with this feast are really not an exception. Thus *bikurim* is almost exclusively a holy offering, while *raysheet* is multifaceted with some aspect of “first” involved, and it has some differences with *bikurim* as some examples will show.

Ex 23:19, “You shall bring the choicest / first [= *raysheet*] of [the] firstfruits [= *bikurim*] of your ground [into the] house of YHWH your Almighty.” Here *raysheet* is descriptive of *bikurim* rather than serving the role of a synonym. The actual form of *bikurim* here is *bikuray*.

Lev 2:12, “[As for the] offering of [the] choice-products [= *raysheet*], you shall offer them to YHWH, but they shall not be offered-upwards [in smoke] on the altar for a sweet aroma.” Here Tanakh-JPS translates *raysheet* “choice-products”, but Tanach-Stone translates it “first-fruit”. The context from verse 11 is a cereal-offering (sometimes translated “grain offering” or “meal offering”). Verse 12 forbids this offering called *raysheet* to be burned on the altar, but in verse 16 part of the cereal-offering called *bikurim* in verse 14 is commanded to be burned by fire. This shows a distinction between *raysheet* (none to be burned) and *bikurim* (part to be burned), although the cause for this distinction is not explained.

Prov 3:9, “Honor YHWH with your wealth, and with the best [= *raysheet*] of all your produce.” Here Tanakh-JPS translates *raysheet* “best”, but Tanach-Stone translates it “first”. Some translations use “firstfruits” here. This indicates a subjectivity in one's decision of how the context should be viewed. Prov 3:9 may well be talking about an offering to the priesthood after the firstfruits offering was made. It may be present to encourage giving to the priesthood whenever the farmer notices a particularly excellent item. If *bikurim* is the Hebrew word, you know it refers to commanded firstfruits, unless the context clearly shows it to be totally different. When *raysheet* is used, it requires some subjective thought and perhaps uncertainty concerning whether it refers to the first offering of that crop to the priesthood in its normal fashion where *bikurim* could also have been used. The word *raysheet* may refer to “first in quality”, i. e., best or choicest. Perhaps the context has a highly unique usage for which *bikurim* would not fit in its normal usage, so that *raysheet* was used instead.

There are two places among the 51 in which both Tanakh-JPS and Tanach-Stone agree to use “firstfruits“ for *raysheet*: Neh 12:44 (Tanakh-JPS has “first fruits” and Tanach-Stone has “first-fruits”) and Ps 78:51 (Tanakh-JPS has “first fruits” and Tanach-Stone has “first fruit”).

Since the two words *bikurim* and *raysheet* generally have distinctions between them, it seems preferable in the vast majority of cases to use a translation that preserves this distinction.

When a grain (i. e., cereal) offering is involved, the small quantity has value for human consumption even during the milky phase of development, and this is long before the normal time for general reaping. This implies that whether the word *bikurim* is used or *raysheet* is used for a grain item, that item certainly has value for human consumption. Indeed it must have such a value if the context implies that the priesthood will consume it. However, no particular stage of development of the grain is implied by these words. Ripeness for general reaping is not implied by these words when applied to grain.

[81] Meaning of Lev 2:14-16 which contains *aviv*

The following is my very literal painstaking translation from the Hebrew. Lev 2:14, “And if you-offer a cereal-offering of firstfruits [= *bikurim*] to YHWH, you-shall-offer ears roasted/parched-grain with fire, [that is] fresh-grain crushed-grain [for a] cereal-offering of your-firstfruits [= *bikurim*]; Lev 2:15, and you-shall-put oil upon-it and lay frankincense upon-it; it [is] an offering.

Lev 2:16, And the priest shall burn its-memorial-portion from its-crushed grain and from its-oil with all its-frankincense, an [offering by] fire to YHWH.”

In verse 14 “cereal-offering” occurs twice and is the translation from the Hebrew word *minchah*, Strong's number 4503. This word is discussed on page 585 of BDB where Lev 2:14 is listed under meaning 5, “grain-offering”. There are certainly examples in which *minchah* is used for any offering, not specifically a cereal offering. However, when this word occurs in several verses in Leviticus, the Hebrew word order and the obvious outline meaning shows that it could not refer to merely any possible sacred offering; instead it must be a cereal offering. In Lev 2:14, the Hebrew word order with the word “if” shows that there is an implied comma that

terminates the “if” clause immediately after “YHWH”. With the implied comma correctly placed after “YHWH”, and with *aviv* coming after “YHWH”, *minchah* must mean “cereal-offering” because *aviv* refers to some aspect of grain. On page 37 of Gary Anderson's book about offerings to the priesthood, he wrote, “The Hebrew word *mincha* has two very different meanings in the Hebrew Bible. On the one hand it can have a cultic [this refers to a worship context] meaning. In this instance it can mean 'offering' in the generic sense, either animal or vegetable, or as in the case of the priestly writer it can refer specifically to the cereal offering.” Tanakh-JPS translates *minchah* “meal offering” here, and Joseph Magil's literal interlinear translation adds a hyphen rendering it “meal-offering”.

In verse 14 “firstfruits” (*bikurim*) occurs twice. The previous chapter explained that no particular stage of development of grain is implied by this word. It may even be used for the milky phase, and in II Ki 4:42 it is used for barley grain that was made into bread, so that it was fully ripe in order to be good for making flour. The other words in this verse do not limit the stages of development of the grain that is used because of the structure of this verse and because there is nothing provable in the use of those later words that force a limitation, unless the reader has a prejudicial assumption that does not come from the Tanak. An outline paraphrase of this verse is: “If you offer a cereal offering of firstfruits to YHWH, here is how to do it.” The remainder of the verse describes the method. Lev 2:14-16 gives a description of how to perform the firstfruits cereal offering. There is nothing to restrict it to one kind of cereal crop such as only barley or only wheat.

In verse 14 “ears” is the most general translation from the Hebrew word *aviv*, which comes immediately after “YHWH”. To the ancient Israelite the meaning of *aviv* was part of their culture and was well known. The verse informs us to begin the method with *aviv*. The rest of Lev 2:14 also relates to the method. The other words will be discussed below. The purpose of this verse is to explain the nature of a firstfruits (*bikurim*) cereal offering. It is not intended to define *aviv* and is merely an example of its use. The only other biblical context with *aviv* outside of the phrase *chodesh ha aviv* is Ex 9:31-32, which will soon be discussed in great detail.

In verse 14 “roasted/parched-grain” is the translation from the Hebrew word *kali*, Strong's number 7039. On page 1102 of HALOT “roasted grain” is the meaning. On page 885 of BDB “parched grain” is the meaning. Page 281 of Flannery discusses the purpose of roasting: “Sometime around the end of the

Pleistocene, man discovered that by roasting the grain he had collected he could render the glumes so dry and brittle that they could be removed by abrasion. At several sites this was accomplished by roasting the cereals over heated pebbles in a pit or subterranean earth oven (cf. van Loon 73).” When the water content of the grain is relatively high so that it is not solid inside, the word parching applies, which connotes drying along with roasting. This Hebrew word is ambiguous, so that roasting or parching applies.

In verse 14 “crushed grain” is the translation from the Hebrew word *geresh*, Strong's number 1643. Page 176 of BDB defines this as “a crushing” and “groats, grits”. Page 204 of HALOT defines this as “crushed new grain, groats”. This Hebrew word *geresh* bears no resemblance to the Hebrew words for grind (Strong's numbers 2911, 2912, 2913 found in BDB page 377 column 2). Thus the description in Lev 2:14-16 from *geresh* does not require that flour is obtainable from the *aviv* mentioned in Lev 2:14. This word *geresh* also occurs in verse 16. There is enough ambiguity in *geresh* that it may be used for any stage of the ear's development.

In verse 14 “fresh-grain” is the translation from the Hebrew word *karmel*, Strong's number 3759. Conflicting opinions abound for the meaning of this word in the lexicons, and reasons for this will now be explained. Pages 325-336 of TDOT discuss this noun. On page 327 the theory that *karmel* means “complete” is mentioned, but in order for this theory to be valid, it requires dropping one consonant from *karmel* to obtain the Arabic verb *kamala*, and Arabic is not an extremely close Semitic language to Hebrew, thus the evidence is weak. Moreover, according to page 327, no Semitic cognate to *karmel* has been found in which the context is similar to its usage in Lev 2:14; 23:14; II Ki 4:42. Examples with the Arabic verb *kamala* do not involve plants. The meaning of *karmel* as “new grain” (in the sense of fresh grain) is discussed on page 328. Two of the three of these verses with *karmel* involve firstfruits (exclude Lev 23:14), which is “new” in the sense that it is fresh from the ground. The question is whether there is evidence for the meaning of *karmel* as “newly ripened grain” without using Rabbinic literature, which is favored by some lexicons. The NRSV translates *karmel* as “fresh ears”, thus dropping the Rabbinic “ripened”, and most translations follow this. The REB translates *karmel* as “fully ripened grain” which mixes the meaning of the Arabic verb *kamala* (complete) with the Rabbinic “ripened”.

In Lev 23:14 three categories of food from barley are mentioned that are not to be eaten before the wave sheaf offering is performed. First is bread, second is roasted grain, and third is *karmel*. In Luke 6:1 we find the case of eating grain fresh and raw directly after picking, so it seems rational that this would constitute the third category of food from grain. This would more fit the meaning of “fresh”, i. e., recently picked and without alteration. In Lev 2:14 this would be *karmel* before it was crushed and then roasted. TDOT favors the meaning “new grain”, which means fresh grain. The conclusion is that *karmel* means fresh grain because there is no clear connection to the Arabic verb *kamala*, meaning “complete”. There is no requirement that *karmel* needs to be ripe in the sense of being ready for general reaping.

On page 231 of Weis there is a brief discussion of the difference of opinion between the Talmudic Rabbis and certain Karaite opponents concerning Lev 2:14. Here is the comment. “According to the Rabbis, the oblation of first-fruit in Lev. ii.14 is identical with the first-fruit-sheaf of barley ordained in Lev. xxiii.11-12. Otherwise [say the Rabbis] no offering whatsoever could be brought of the new grain [Lev 23:16] before the two loaves have been presented on the Feast of Weeks. According to the Karaites, Lev. ii.14 is a private oblation brought voluntarily [note Lev 2:14 begins with “if”] by the individual of the first-fruit of his barley, oblations of the new barley being allowed to be offered in the interval between the presentation of the first-fruit-sheaf [wave sheaf] and that of the two leavened loaves. Thus, according to the Karaites, the designation [new grain offering in Lev 23:16] *minchah hadashah* suits the two leavened loaves only in so far as, being of the new wheat, they are a new oblation in kind [different kind of plant], whilst according to the Rabbis, they are new as an offering.” There is insufficient biblical cause to insist that Lev 2:14 is talking about the wave sheaf offering. The use of “if” at the beginning of Lev 2:14 could simply acknowledge that many heads of household may not have any cereal plants, and they would be exempt due to lack of such a product.

The conclusion is that Lev 2:14 does not restrict *aviv* to be any particular stage or stages of development of the ear of grain. The use of firstfruits in this context of a cereal offering is not restrictive because it refers to a food item that is edible by people.

[82] Southern border of Ancient Egypt when the Israelites were Slaves

The Israelites were slaves in Egypt where the plague of hail was destructive, mentioned in Ex 9:22-34. In order to fully grasp the context involving all of Egypt, the southern border of ancient Egypt is worthy of discussion. Ezek 29:10 states, “Indeed, therefore, I am against you and against your rivers, and I will make the land of Egypt utterly waste and desolate, from Migdol to Syene, as far as the border of Ethiopia [3568 *koosh*].” On page 98 in Sten Hidal 1977 we find that the ancient city of Syene is the location of modern Assuan (or Aswan), just north of today’s Aswan Dam in southern Egypt. Evidently Syene was the most southern city of ancient Egypt.

The name of the territory called *koosh* in biblical Hebrew is often translated Ethiopia, as seen above in Ezek 29:10. On page 27 of Margaret Shinnie 1970, we read, “KUSH is THE name that was given by the ancient Egyptians to the kingdom which lay to the south of their borders. This kingdom became really important in the time of the Meroitic people, and was the most ancient of the independent kingdoms of Africa. It spread over a part of the country which we now know as the Republic of the Sudan, to the south of Egypt, and like Egypt, it has always been dependent on the great river Nile for its life.” From this we see that geographically, the translation “Ethiopia” should be approximated with modern Sudan, not modern Ethiopia.

On pages 3-4 of Stanley Burstein 1998, we note, “Kush is the term the ancient Egyptians used to designate the upper [in altitude above sea level] Nile Valley south of Egypt and the various civilized states that occupied part or all of that region from the early second millennium BCE [c. 2000 BCE] to the end of antiquity. The historical significance of these states is considerable. By the early first millennium BCE they [the Kushites] had succeeded in unifying virtually the whole of the Nile Valley from near the southern border of contemporary Egypt at Wadi Halfa to a still undetermined point south of Khartoum, the capital of the modern Republic of Sudan.” From this we see that the southern border of ancient Egypt back to about 2000 BCE was approximately the same as the southern border of modern Egypt.

Later on page 4, we note, “Kush and its last and most famous capital, the city of Meroe (located near the junction of the Nile and the Atbara rivers in the central Sudan), were well known to the Greeks and Romans under the name Aithiopia (‘land of the burnt faced people’).” On page 37 of Liddell and Scott under the Greek word entry *Aithiops*, we find, “properly, *Burnt-*

face, i. e. Ethiopian, Negro, ...” The Romans who spoke Latin borrowed this Greek word into their language. When Jerome translated the Hebrew Bible into Latin, which became known as the Vulgate, he translated the Hebrew word *koosh* in Ezek 29:10 into the Latin *Aethiopiae*; for example, see page 862 of VULGATE. In the Septuagint translation of the Hebrew Bible into Greek, Ezek 29:10 has the Greek *Aithiops*, which may be found on page 10 of Appendix 1 in Hatch and Redpath 1998 where all places in which the Hebrew *koosh* is translated into the Greek *Aithiops* are listed. The English name “Ethiopia” is a transliteration from the Greek name *Aithiops*, Strong’s number 128, found in Acts 8:27.

On page 9 of Stanley Burstein 1998, we note, “Only in the first millennium BCE did a fortuitous combination of circumstances free the Kushites from this cruel dilemma [Egyptian domination and exploitation] and allow their civilization to grow and flourish.” Later on page 9 we see, “Indeed, for a brief period in the eighth and early seventh centuries BCE, Kushite kings were even able to turn the tables and conquer and rule Egypt (ca. 712-664 BCE).” The conclusion is that the southern border of ancient Egypt when the Israelites were slaves there was about the same as it is today.

[83] Introduction to the Plague of Hail and Ex 9:31-32

The account of the plague of hail upon Egypt appears in Ex 9:22-34. Verse 31 has a very significant use of *aviv* in a meaningful context that provides excellent information regarding the meaning of *aviv*. In order to squeeze out all of the meaning from the context, a variety of factors will have to be considered including Egyptian climate, geography, topography, and agriculture.

In Ex 9:22 Moses is given the instruction [NRSV] “Stretch out your hand toward heaven so that hail may fall on the whole land of Egypt, on humans and animals and all the plants of the field in the land of Egypt.” By examining the Hebrew text for this it will be noted that the Hebrew word *kol*, Strong’s number 3605, occurs twice in this verse, first as *whole* (whole land of Egypt) and second as *all* (all the plants). Notice that it does not say *all* pertaining to humans and animals because they may take shelter within man made structures, but plants of the field cannot take shelter and “all the plants of the field in the land of Egypt” are mentioned. This verse provides a purpose for the hail, namely that it reach exposed humans and animals and

all outdoor plants. Verse 26 gives an exception [NRSV], “Only in the land of Goshen, where the Israelites were, there was no hail.”

In Ex 9:24 a further aspect of this miracle is shown [NASB], “So there was hail, and fire flashing continually in the midst of the hail, very severe, such as had not been in all the land of Egypt since it became a nation.” Here again the Hebrew word *kol* occurs for *all* (all the land of Egypt since it became a nation). The severity was miraculous, so that one cannot discuss its damaging effect in terms of normal sized hail. Another interesting point here is that it describes Egypt as having become a nation some time in the past, and what happened pertains to all of that nation. Verse 25 is especially emphatic because it mentions the Hebrew word *kol* four times [NASB], “And the hail struck all [*kol*] that was in the field through all [*kol*] the land of Egypt, both man and beast; the hail also struck every [*kol*] plant of the field and shattered every [*kol*] tree of the field.” What is amazing here is that the Hebrew word for shatter is *shebar*, Strong's number 7665, and it does mean to break. It was such miraculous hail that it broke every tree of the field, certainly not any normal or isolated hail, but especially severe everywhere that trees grew in Egypt.

In the above verses from Ex 9:22, 24-25 the Hebrew word *kol* (= all) occurs seven times for emphasis. While it is true that in Hebrew this word means “almost all” or “all”, and does not necessarily mean 100 percent, this does not affect the reasoning to be used from this.

Ex 9:31-32 contains the Hebrew word *aviv* in this context [NASB], “Now the flax and the barley were ruined, for the barley was in the ear and the flax was in bud. But the wheat and the spelt were not ruined, for they [ripen] late.” Here the entire phrase “was in the ear” is given for the Hebrew word *aviv*. Joseph Magil, a teacher of Hebrew to Jewish youths, on page 158 of his literal interlinear phrase by phrase translation, uses square brackets in writing “[was in the] ear”. Magil also wrote, “the flax [was in] blossom”. To show what is implied about the meaning of *aviv* from this context it is necessary to discuss a little about agriculture in Egypt and more specifically about the time of the barley harvest in different parts of Egypt.

[84] Winter Grain, Agriculture, and Rainfall in Ancient Egypt

Except for the northern east-west strip of Egypt that comes close to the Mediterranean Sea, Egypt is a desert with less than two inches of rainfall

each year. If there is no artificial irrigation, barley requires about eight inches of rainfall during the growing season for a crop to come. The only reason that Egypt produced abundant highly valued crops is that the annual overflowing of the Nile River provided much water that was highly mineralized from the mountains originating far south of Egypt, and the Egyptians had learned how to trap this water and slowly release it to irrigate their farmland along the banks of the Nile River. Once each year the Nile overflowed its banks beginning about the middle of July, and then three months later about the middle of October the water receded so that sowing the grain crops may begin.

The source of the water for the Nile River is rain and melting snow from the mountains of Africa. The sowing of grain crops in Egypt about the middle of October will soon cause these grain crops to remain essentially dormant during the coldest part of winter, and then slowly begin to grow with gradually developing grain as the temperature begins to warm. When a grain crop is dormant during the cold of winter, it is called a winter crop. Thus we speak of winter barley and winter wheat when the context is during the months of October to May in the northern hemisphere. With sufficient water from the Nile River overflow saved in containers, a second and third grain crop may also be grown later that year near the Nile banks, but that annual timing is not winter grain and that annual timing is not controlled by the natural cycle of the Nile River along with the natural cycle of the seasonal temperature.

In Egypt, the triangular Delta has one side bordering the Mediterranean Sea, and the Nile flows north into the Delta where it splits into a few tributaries that keep the whole Delta productive with crops. The ancient city of Memphis is 110 miles south of the Mediterranean Sea and is at the southern tip of the Delta. Modern Cairo is about 25 miles north of Memphis, within the Delta. Cairo is part of the desert with no more than about 1.5 inches of rain per year. When the Romans began to govern Egypt about 30 BCE, they divided it into three large districts. Page 168 of Talbert is titled “Roman Egypt”, and states, “For administrative and fiscal purposes the province [of Egypt] was divided into three large districts - Delta [Lower Egypt in the north], Heptanomia [Middle Egypt], and Thebaid [Upper Egypt in the south]; to the last of these was also joined the frontier zone of the Dodecaschoenus beyond the natural barrier of the First Cataract.” The distinction between Upper, Middle, and Lower relates to elevation above sea level; the Nile flows from the high elevation of Upper Egypt in the south to

the low sea level elevation of Lower Egypt in the north. A good map of Ancient Egypt is shown on page 167 of Talbert.

Ancient Egypt extends from the Mediterranean Sea to the First Cataract, a straight distance of 500 miles, although the Nile twists and is thus a little longer up to the First Cataract. In rounded numbers the 500 miles is split into the northern 100 miles (Delta), the middle 150 miles (Heptanomia), and the southern 250 miles (Thebaid).

The first dam at Aswan, which is at the First Cataract (the southern boundary of Ancient Egypt), was built in 1889. This dam controls the annual floods along the Nile River and thus disrupts the ancient natural timings for some agricultural events. The dam provides energy for a continuous electrical supply and it provides a constant water flow. Artificial fertilization is used today. One must be cautious about using modern harvest data with its timings as if it was applicable to the distant past for winter grain.

[85] Smith's Paper and Ears of Winter Barley in Egypt

In 1883, six years before the first dam at Aswan was built in southern Egypt, biblical scholar W. Robertson Smith published a paper (see a copy of this paper in Appendix G) concerning the time of the winter barley harvest in Egypt. Our interest is in the winter barley, which is planted about the middle of October throughout the Nile River basin and grows only slightly during the coldest part of winter. The last paragraph in Smith's paper helps to clarify and reconcile the reports numbered under points 2 and 4 in his paper. Smith points out that the source of information that was sent to him in point 2 means "about ready to harvest" when he states, "is in ear", but the source of information in point 4 means "the ear has just formed" when he writes, "is in ear". Writing about southern Egypt, point 2 shows that the barley is ready to harvest from latter February to the middle of March. Point 4 shows that a little north of Cairo the barley is ready to harvest about the beginning of April. At the end of point 2 we find, "The difference between upper and lower Egypt is about 35 days." This 35-day period for the typical time of reaping in the south to the typical time of reaping in the north is the time from latter February to the first part of April.

Point 4 in the paper shows that the barley a little north of Cairo has its ear formed in the beginning of January although it is not ready to harvest until the beginning of April. Hence barley remains in the ear for about 90 days

from its formation until its reaping at the location a little north of Cairo. This approximate 90-day period of being in the ear is based upon the climate at this part of Egypt where the temperature gets warmer very gradually. This does not hold true for all locations. The colder the climate during winter, the faster the transition from cold to warm weather, and therefore the more quickly this total 90-day period is shrunk. This means that in Israel where the winter weather is a little colder, this 90-day period of being in the ear is reduced somewhat. The variety of barley is also a factor that would alter the total time that the barley is in the ear. The colder weather in the north of Egypt retards the ripening process so that the time for harvest in the extreme north is about 35 days later than in the extreme south.

[86] Lewis' Book and Ears of Winter Barley in Egypt

Page 115 of Lewis' book about ancient Egypt states, "The following is the schedule of major activities in an average year in the vicinity of Memphis [southern tip of the Delta] and the Arsinoite nome [about 40 miles further south], with each phase coming two to four weeks earlier in the Thebaid [southern district of Egypt]." This says that from the southern part of ancient Egypt to the southern tip of the Delta there is a four-week (28 day) difference in harvest. Page 116 states "April [Pharmouthi] The grain harvest begins. May [Pachon] Harvesting continues, threshing begins." This is fully consistent with the paper by Smith when allowing for a seven-day span from the northern end of the Delta to the southern end of the Delta, which is 110 miles. Page 115 of Lewis states, "October [Phaophi] The Nile flood is past. Sowing of cereal crops begins."

[87] Hartmann's Book and Ears of Winter Barley in Egypt

Hartmann's book about ancient Egypt discusses the main exporting region of the Delta on page 122 when he states (translated from the French by James Evans, a friend who enjoyed reading his French Bible during his lunch hours), "The harvest of cereal grains was generally carried out at the end of four months for barley and of five months for wheat (4), which is to say, in the months of April and of May." This is also consistent with the previous data.

[88] Pliny the Elder and Ears of Winter Barley and Wheat in Egypt

Writing in the first century about the main exporting region of the Delta, Pliny the Elder states on page 229 of Pliny_5, "... in Egypt barley is reaped in the sixth month after sowing and wheat in the seventh, ..." Sowing begins about the middle of October and continues into November. The first month after sowing is about November. The sixth month after sowing is about April. Pliny is saying that barley in the Delta is reaped in April and wheat is reaped in May. This is as Hartmann understands it, and it agrees with the earlier sources quoted. Pliny is only estimating the time difference between the harvest of barley and wheat to the nearest month. The specific variety of each crop may cause this time difference to vary.

Michael Zohary, a professor of botany from Hebrew University in Jerusalem, wrote on page 76 of Zohary 1982, "... it [barley] ripens a month or more before wheat, ..." This implies that one might expect there to be more than a month's difference with many varieties of these two cereal crops. One might approximate the time difference between reaping barley and wheat to be about the same as the 35-day difference from southern Egypt to northern Egypt for reaping barley. This means that when barley is reaped in the far north of Egypt in early April, wheat is about ready to be reaped in the far south of Egypt.

[89] Ending of Ex 9:32

When Ex 9:31-32 was quoted above from the NASB, the last Hebrew word was translated "[ripen] late". This Hebrew verb is *afeel*, which is Strong's number 648, but the specific verb form is *afeelot*. When discussing this word on page 357 of DCH, a translation of the end of Ex 9:32 is given with the words "the wheat and the spelt were not damaged for they are late (crops)". Thus DCH translates *afeelot* as "are late (crops)". Pages 46-47 of Klein translate *afeel* as "ripening late", and Klein relates this to the Akkadian (Assyrian) word *apatu* "to be late". Klein is especially careful in applying the scientific principles of etymology to words, even using the words "possibly" or "probably" to show speculation, and when there are no grounds for speculation, Klein says nothing. Klein is an excellent source for correcting older sloppy careless guesses for etymology. Page 128 of Cohen 1978 translates this "late (of crops)". On the same page Cohen writes, "Contrast both KB I, 77 [a German work], and HALAT, 76 [a German work], where the attempt to derive this term from the root *ofel* 'to be, made dark' is semantically impossible and must be rejected." Cohen is stating that he agrees with the two German lexicons (which he abbreviates KB and

HALAT, and which I looked up) that *afeel* is not derived from a word that means “to be made dark”. Perhaps the reason for this fuss by Cohen is that on page 66 of BDB, for *afeel*, we see “(darkened, concealed, thence) late, of crops”, so that BDB seems to be attempting to etymologically derive this word from “darkened”. None of the recent Hebrew lexicons agree with BDB on this and there is no evidence for this. The English translation of the German reference HALAT is abbreviated HALOT. On page 78 of HALOT the meaning of *afeel* is “late in the season”.

The NASB does accurately capture the meaning of Ex 9:32, “But the wheat and the spelt were not ruined, for they [ripen] late.”

[90] Conclusions on the Time of the Hail and the Meaning of *aviv*

Based upon Ex 9:22, 24-25 mentioned above, the purpose of the hail throughout Egypt, and the fact that Ex 9:31-32 speaks in a general way for the effect of the hail, not confining the damage to some local region, we now consider the approximate time of this extraordinarily heavy miraculous hail.

Point 4 in the paper by Smith (top of page 300) shows that in northern Egypt the ear of barley is formed in the beginning of January and in southern Egypt the barley is ready to harvest in the latter part of February. Because it is warmer in the south, ear formation of barley south of the Delta would have occurred before January 1. This makes it obvious that the hail plague occurred sometime in January or February, but not at the beginning of January or the end of February.

From Smith's paper item 2(c) states, “When the barley is in ear [to this respondent 'in ear' means 'ready to reap'] the ears of wheat begin to form, but the grains are in a milky state.” This means that about February 15 the barley was soon to be ready to harvest in the far south and the wheat was almost ready to begin ear formation in the far south. In the rest of Egypt the wheat would begin ear formation later. This indicates that the hail plague would not have occurred later than about February 15. In order for all the barley in the south of Egypt to be destroyed, it is very doubtful that the hail would have come before January 15 because at so early a time the ears of barley would only be at the first stage (water ripe) or the second stage (early milk). The greater the ear growth, the greater the likelihood of destruction. The most that can be said with confidence is that the hail plague occurred

between January 15 and February 15, more likely toward the end of that time.

The eleven stages of barley are defined because there are criteria that allow distinguishing between these stages of growth. The 35-day span in ear development from south to north shows that in Ex 9:31 the word *aviv* was applied to all the stages in the 35-day span. Thus *aviv* is not applied to only one stage of barley. The eleven stages are grouped into three phases: milk, dough, and ripening. The entire time of being in the ear at any one location in Egypt is about 90 days. The last of the eleven stages is over-ripe, which would not responsibly occur. This reduces the number of stages to ten in about 90 days. This is about nine days per stage. In 35 days there are about four stages. The middle phase is the dough phase, which has three stages. With a 35-day spread, the ears would encompass either the pair “milk phase and dough phase” or the pair “dough phase and ripening phase”. Perhaps all three phases might even be represented.

This is evidence from the Tanak along with Egyptian agriculture that the Hebrew word *aviv* has a wide range of meaning in stages of growth rather than a narrowly defined meaning of one stage.

Writing in 1880, August Dillman discusses the timing of the hail plague on pages 88-89 based on sources that he mentions (avoiding any discussion of the difference between northern and southern Egypt), and he estimates that this occurred in January. Without giving any details, on page 244 Hertz writes, “The time indicated is the end of January or the beginning of February.” Both of these authors chose dates that fall within the range between January 15 and February 15, the conclusion attained using Smith's paper with other corroborating sources.

On page 103 of DCH, the meaning of *aviv* is “ear (of cereal)”, and one context it cites for the use of *aviv* is from “The Temple Scroll” (abbreviated 11QT) 19:7 where it gives the translation “new bread (made of) ears of various cereals”. Here the plural of *aviv* is translated “ears” and implies that the ears were ground into flour in order to make bread. This example of the use of *aviv* from c. 150 BCE shows that the range of the meaning of *aviv* extends to being fully ripe so as to be able to make flour.

Conclusions about *aviv*: From the context of Ex 9:31-32 alone, the word *aviv* does include multiple stages of the development of ears of barley.

Either the milk and dough phases are represented, or the dough and ripening phases are represented. The flexibility in the language of Lev 2:14 allows the firstfruits of the cereal offering to include all stages in the development of the ear of grain, and *aviv* is applied to such firstfruits. This implies that *aviv* means “ears” without restriction to any stage or stages of growth. The Dead Sea Scrolls from c. 150 BCE shows that *aviv* includes a state of grain that allows flour to be made from it.

In the expression *chodesh ha aviv* the word *aviv* is a descriptive name meaning “ear”. This expression literally means “month of the ear(s)” or “month of ears”. There is also no harm in using a transliteration such as “month of Abib”.

[91] Time of the Barley Harvest in Israel

My translation from page 415 of Dalman is, “The harvest that I first observed at Jerusalem on May 8, 1925 was during barley and wheat blossoming, and in the middle of the same month the barley harvest began, in which, on May 24, I used the ripping sickle. On May 19, 1926 the farmers in Jerusalem saw the barley harvest nearly completed, the wheat harvest still remaining. In Jericho the barley harvest is first permitted to begin about the middle or end of April, for on the 18th of April, 1909 I saw it nearly mature there. For the coastal plains April can be predicted as the time of the barley harvest, May as the time of the wheat harvest. At Tiberias on the Sea of Galilee one predicts the beginning of the harvest of broadbeans, jointed vetch, and barley from the middle of April onward; wheat harvest first starts in May and continues through July. For ... Bethlehem May is the time of the [harvest of] legumes, June is the time of [the harvest of] barley and wheat. In general, for the beginning of the barley harvest in mountainous areas one must wait until the middle of May; the beginning of the wheat harvest is sure to occur about the start of June. On the coastal regions and plains of Jordan the beginning will occur about perhaps 14 days earlier.” This shows that the time of the barley harvest varies from about the middle of April in Jericho to June in Bethlehem, which is a span of about seven weeks.

[92] Comparison of Barley Harvest in Egypt and in Israel

When comparing the time of the barley harvest in Egypt with the time of the barley harvest in Israel we see that the harvest in Israel begins at about the time that the harvest in Egypt is finished. In Egypt the barley harvest runs

from about the latter part of February to the first part of April (a five week span), while in Israel it runs from about the middle of April to early June (a seven week span). Certainly there are variations in some years due to abnormalities in the temperature. This is a general picture, but it shows a significant difference between Egypt and Israel.

[93] Lack of Applying *aviv* to Ex 12:2

The word *aviv* does not occur in the immediate context of Ex 12:2, which was spoken to Moses and Aaron in the land of Egypt [NASB], “This month shall be the beginning of months for you; it is to be the first month of the year to you.” The lives of Moses and Aaron indicate that they were never in Israel and were quite unfamiliar with the time of the barley harvest in Israel. Does it make sense to think that when Moses and Aaron heard the words of Ex 12:2 they thought of the barley in Israel? The context of Egypt and the context of Israel are very different for barley. Now consider the time difference from Ex 9:31-32 to Ex 12:2. From the previous discussion, the time of the hail plague was between January 15 and February 15, and the barley was in the ear (*aviv*) throughout Egypt. This is more than a month before the vernal equinox. Moreover, the earliest place in Israel at which the barley harvest may begin is typically near the middle of April, which is at least two months after the hail plague. After the plague of hail there was a plague of locusts and then a plague of darkness. Then came Ex 12:2. From the context nothing prevents a separation of about two months or more. Ex 9:31-32 is not in the time context of Ex 12:2, nor is it in the immediate context of Ex 12:2. With the difference in the time of the barley harvest between Egypt and Israel, Ex 9:31-32 should not be associated with the barley harvest in Israel. There is no reason for Moses and Aaron to think about the status of barley at Ex 12:2 because the word *aviv* is not even in the latter verse.

One may not arbitrarily grab the expression *chodesh ha aviv* from Ex 13:4 and shove it into Ex 12:2 in order to force this expression to be the quality that defines the first month. If some state of barley in itself was to define the timing of the first month, then it would be of the greatest importance for barley (or *aviv*) to appear in Ex 12:2, but neither word is there! The word *aviv* applies to all stages of the ripening of grain, and thus it does not pinpoint a single month, especially when considering the whole of Israel where there is a seven week difference in the time of the ripening of barley. The adjective “first” does not appear in the expression *chodesh ha aviv*, so

that attempts to narrow the meaning of this expression from an agricultural viewpoint are not based upon biblical evidence. Claims that the first biblical month is the one which shows the first ripening of barley in Israel cannot be found in Scripture.

[94] Gen 1:14 is a Cause and Effect Verse with Light, not Heat

Gen 1:14, “And the Almighty said: Let there be lights [3974 *mahohr*] in the expanse of the heavens to separate between the daytime and between the night, and let **them** be for signs, and for appointed-times [4150 *moed*], and for days and years.”

Gen 1:15, “And let **them** be for lights [3974 *mahohr*] in the expanse of the heavens to give light on the earth, and it was so.”

Although there is no single chapter that explains the calendar of the Tanak in a thorough way, Gen 1:14-18 does provide an outline of the calendar by showing the ingredients that are needed. The biblical viewpoint is that for an observer on the earth the cause is the lights, one effect is the days, another effect is the appointed-times (which includes the festivals from Lev 23), and another effect is the years. It would take some specific direct Scripture to overturn these cause and effect outline verses for the determination of all aspects of the calendar.

There are three elements that make up a calendar: the day, the month, and the year. The day is determined through the alternation of dark and light, a visible sign of the sun. The beginning of a month is determined through the reappearance of the moon, the new crescent, which is a visible sign of the moon. The pattern has been established with the outline principle from Gen 1:14-15 that the day and the month are visible signs of the lights in the heavens. This pattern from visible lights should be continued to establish the month that is the first month based upon the visible sign of the sun called the vernal equinox as explained in a previous chapter.

It is the *heat* from the sun rather than the *light* from the sun that is of primary importance for the ripening of winter barley. All of Israel gets the same amount of light each day except when there is a difference in cloud cover or rain, but not the same amount of heat each day. The difference in *heat* is the primary reason for a seven-week difference in the time in the ripening of barley in Israel. Gen 1:14-18 mentions nothing about heat, but repeatedly mentions the role of light and lights. Any attempt to reason that

the light from the sun indirectly causes the time of the first month through the effect of the sun's light upon the barley is weak reasoning because the light is not the heat and because there is no Scripture that mentions this indirect reasoning as a definition for the determination of the first month. Gen 1:14-18 is an astronomical context, not an agricultural context.

[95] Septuagint's Translation of *aviv*

The Septuagint, often abbreviated the LXX, is the oldest translation of the Hebrew Bible that was made. In this sense it serves as a commentary on the Tanak, which is the Masoretic Text of the Hebrew Scriptures that has been preserved by the Scribes and later Masoretes. If the Septuagint is to be used to help determine the meaning of the Tanak, there should be at least a little discussion concerning the hazards of using this Greek text. The Hebrew text from which the LXX was translated is called the *Vorlage*. Since we do not possess the *Vorlage*, any substantial difference between the meaning of the Tanak and the LXX might be the result of a difference between the *Vorlage* and the Tanak. For this reason alone there is always a need for some sensible judgment in weighing the use of the LXX.

About the year 375 Jerome was asked to make a new accurate translation into Latin of the inspired writings of the Jews, and as expected, he began with "the" Septuagint, but he soon recognized a major problem. There were many texts of the Septuagint, and they had numerous differences. How could he decide which text was correct? He had no answer, so he decided to learn Hebrew and consult the texts preserved by the Jews. He discovered that the Hebrew texts available to him were all virtually identical, so he believed that using the Hebrew text would produce the best result in Latin. Therefore, for this Latin translation project, he abandoned the Septuagint, and instead only used the Hebrew Scriptures, which was the Tanak. If he had any question about the meaning of a Hebrew word or phrase, he consulted knowledgeable Jews.

Thus two major weaknesses of the LXX are that we do not possess the *Vorlage* and we do not possess the original LXX translation; there are many differences among the surviving handwritten copies of the LXX. Nevertheless, in many cases the surviving texts of the LXX do not differ in any significant way. It is always possible that for some important passage, none of the surviving copies of the LXX agree with the original Greek translation. People who copied the LXX varied in their desire to preserve the

text exactly as they saw it. It is believed that some Christian copyists of certain Messianic texts in the LXX deliberately altered the text to force it to conform to certain details that are found in the New Testament. For most of the books of the LXX, the oldest copies we have date only to c. 300 or to the time of Origen c. 225.

The translation method used for the LXX differs greatly from book to book. Some are done more literally and some are more paraphrased. Some books transliterate certain technical words while others translate such words. It appears that for certain Hebrew words the translation often differs. There are known instances in which the translator of the LXX was uncertain of the meaning of a Hebrew word and thus a Greek translation was chosen that had a pronunciation similar to the Hebrew word, but with a surely incorrect meaning. In other words, the meaning of some Hebrew words was not known to some or all of the translators, so that guesses were made.

Concerning certain matters in the biblical text, there may have been a controversy among Jews during the time that the LXX was first translated or later copied, and this may have introduced a translation bias in favor of one controversial interpretation.

From all of this discussion we can see that great caution must be exercised when attempting to understand the meaning of a Hebrew word in the Tanak from an examination of the Greek in the LXX.

Concerning all six places in which the Hebrew expression *chodesh ha aviv* occurs in the Tanak (Ex 13:4; 23:15; 34:18, 18; Deut 16:1, 1), only one expression is used in the LXX, the Greek *meni ton neon*, which means “month of the new [grains]”. The grammatical form of *ton neon* is plural, so that it implies a plural noun. This consistency in all places lends weight to the belief that there was a consistent understanding of its meaning when it was translated. The word “new” seems to imply fresh grains on the stalk, and does not commit to any degree of ripeness. On the one hand the LXX does appear to translate this as a description, but a name may also be translated, so that a name may appear to be a description. Semitic names are often descriptive. However, the description is not sufficiently unique so as to determine only one month, because multiple stages of barley ear growth may satisfy this description. These six places are seen in the Greek on page 922 of Hatch and Redpath under the word for month, or they may be looked up

individually in Brenton. Since the word “grains” is merely implied, “ears” or “heads” may be a reasonable substitute.

In Ex 9:31 where *aviv* occurs, a literal translation from the Hebrew is “barley [was in the] ear”. The LXX has the Greek word *parestekuia* where *aviv* occurs, and this means “[was] advanced”. The Greek with translation may be seen in Brenton; the Greek is also on page 786, column 1, of Hatch and Redpath under the Greek word *krithe*, meaning barley, at Ex 9:31. This is not precise.

In Lev 2:14 where *aviv* occurs, the LXX has *nea*, which means “new” or “fresh”. This is not precise.

In conclusion, the LXX merely uses loose expressions for *aviv*, and does not imply a precise definition that would determine only one month by its description.

[96] Meaning of *aviv* from the *Mishnah*

The word *aviv* appears in the *Mishnah* (c. 200) in Kil'ayim 7 where translations give its meaning as “ears” or “green ears”, although the context and commentary provide more understanding. The context involves a growing cereal plant in the ground where it should not be growing because its growth is a violation of Deut 22:9, which prohibits growing multiple crops together. The passage bearing the word *aviv* along with comments appears on page 117 of BT-KI. The passage is: “R. Akiba said: If it [a growing cereal plant] has produced [only] blades, he must turn the soil; if it has reached the stage of green ears [= *aviv*], he must beat them out; if it has grown into corn, it must be burnt.” Footnote 6 concerns “turn the soil”, where it states, “So as to ensure that they do not grow again.” Footnote 7 concerns “the stage of green ears”, where it states, “I. e., before it has reached a third of its normal full growth.” Footnote 8 concerns “grown into corn”, where it states, “And make no use of either grain or stalk ...”.

From this we see that the Rabbinic interpretation of *aviv* from c. 200 when the *Mishnah* was published is the first third of the ear development. This corresponds to the milky phase.

On page 44 of H. L. Ginsberg 1982, where he translated Ex 13:4, he translated *aviv* as “milky grain”. From the previous extensive discussion of

Ex 9:31-32, it has been concluded that *aviv* encompasses multiple stages of the development of barley including some or all of the dough phase, and therefore Ginsberg's viewpoint that *aviv* means “milky grain” contradicts the Tanak as does the position from the *Mishnah*.

[97] Ambiguity of Identifying the Month of *aviv* from the word *aviv*

Ex 9:31-32 has shown that the meaning of *aviv* encompasses several stages of the development of ears of barley. In Israel the beginning of the barley harvest for each area spans a seven-week period. This is clear evidence that the word used for the first month, *aviv*, does not in itself define only one month for the whole of Israel. From the earliest stage of ears of barley in one part of Israel until the barley harvest is completed in Israel spans a time of four, or even five, months.

Because Lev 2:14 uses *aviv* for any grains and any firstfruits of grains regardless of the stage of growth, the presence of *aviv* in the expression *chodesh ha aviv* is too general and hence not sufficiently specific to be able to determine when this month occurs from its description alone, if one entertains the hypothesis of totally avoiding the vernal equinox. If one wishes to propose that “month of *aviv*” is intended to mean “month of first *aviv*” (which the Tanak does not say) and desire to apply this description in Israel to determine the first month, then this would frequently cause the first month to begin in February. In any event, the goal in this treatise is to base proposed practice for the biblical calendar on evidence from the Tanak. When a great deal of individual subjectivity in definition enters the scene, the result is unresolvable controversy. Arbitrary definitions that have no basis in the Tanak must be rejected.

[98] Josh 5:10-12 and the Date of the Wave Sheaf Offering

In the KJV, the Hebrew word translated “old corn” in Josh 5:11, 12 is *avur*, Strong's number 5669. While it is an easy matter to check that all modern scholarly lexicons since the time of Gesenius (early nineteenth century) translate this word as “produce” rather than “old corn”, one should understand the reasons, further details, and the implications. It is true that the Hebrew dictionary at the back of Strong's concordance states that this word means “old corn”, but this dictionary was primarily made by volunteer students who were not scholars, and this should not be classified as a scholarly lexicon.

Page 128 of Ellenbogen points out that the translation “old corn” was an interpretive explanation by the Jewish sage David Kimchi (1160 - 1235), and his influence (by later reputation) among the Jewish scholars responsible for the Hebrew portion of the King James Version led to its adoption of “old corn”. Ellenbogen writes that the Akkadian word *eburu* means produce and harvest (from its ancient contexts that have survived the ravages of time). Often there is little distinction between the Semitic consonants “b” and “v”, and only the deletion of one dot changes the Hebrew letter bet (“b”) into vet (“v”), so that the Akkadian *eburu* is essentially *evuru* which is almost the Hebrew *avur* (“old corn” in the KJV). Ellenbogen also mentions similar words in Aramaic and Syriac with this meaning. This word is discussed on pages 39-40, 65-66 of Cohen 1978 where further references are given for the Semitic background of this word. Page 65 states, “Note finally that *avur* seems to be attested now on an ostrakon from Arad with the meaning ‘harvest-produce.’”

Near the end of Josh 5:12 the Hebrew word *tvuah* (Strong's number 8393) is translated “yield” which the Israelites ate later that year which would then have become stored grain. The word *tvuah* refers to food in storage in Lev 25:22; II Chr 32:28, although in other contexts its age is not relevant to its use, so that the meaning of *tvuah* includes both fresh produce and stored produce. Nevertheless, the contrast of *tvuah* with *avur* in the same context would further indicate that *avur* means fresh produce rather than old grain. A large quantity of old grain would more likely have been stored within the protected walls of Jericho rather than in the smaller less protected area of Gilgal (Josh 5:10), so the context further supports the view that *avur* means fresh produce rather than old grain. This is indirect contextual supporting evidence that *avur* means fresh produce.

According to Lev 23:14 Israel was forbidden to eat of the new crop until the day of the wave sheaf offering. Num 31:25-27; Deut 20:14; Josh 22:8 shows that the spoil of the enemy in the land promised to Abraham, Isaac, and Jacob was to become theirs even though they did not plant it. Hence the new produce was theirs. Thus the wave sheaf offering must have been performed by the date of Josh 5:11 in order for the Israelites to have been permitted to eat that produce. Josh 5:11 states “on the morrow of the Passover”, and this phrase in the Hebrew also occurs in Num 33:3 where it is stated to be the 15th day of the first month. Thus Josh 5:11 was the 15th day of the first month, and the wave sheaf offering must have been offered on (or before)

that date. But it couldn't have occurred before the 15th day because Lev 23:5 mentions the Passover on the 14th day before discussing the days of unleavened bread and the wave sheaf offering. Thus the wave sheaf offering occurred on the 15th day that year, which, according to Lev 23:6 and Num 28:17 was the first day of unleavened bread. Since the wave sheaf offering is mentioned after the seven days of unleavened bread, the “morrow of the Sabbath” in Lev 23:15 must always be one of the seven days of unleavened bread.

In summary, the rejection of the translation “old grain” for *avur* in Josh 5:11, 12 comes from (1) the evidence of a very similar word in Akkadian, Aramaic, and Syriac which are Semitic languages; (2) the meaning of “old grain” is not known prior to Kimchi about 1200 CE; and (3) the indirect implications of the context. Modern scholarly lexicons base their conclusion primarily on (1).

Other aspects relating to the proper count:

(1) The day of the wave sheaf offering is mentioned in Lev 23:15-16, which literally states, “And you shall count for yourself on the morrow of the Sabbath from [the] day you brought the sheaf of waving [to the priest], seven complete [or perfect] Sabbaths they shall be, until on the morrow of the Sabbath the seventh, you shall count 50 day[s], and you shall present a new offering to YHWH.” Here the Hebrew phrase *mee macharat*, meaning “on the morrow”, occurs twice. This shows the ending of the count to 50 on a Sunday (morrow of the Sabbath) and the starting of the count also on a Sunday. Thus Josh 5:11 fell on a Sunday, the first day of unleavened bread.

(2) In Lev 23:16 where it mentions “seven complete/perfect Sabbaths they shall be”, the word “Sabbaths” does not have to mean “weeks”. The Hebrew word for “complete” also means “perfect” and “unblemished” as an unblemished lamb. Seven is the number of perfection and completeness, so that the Sabbath, being the seventh day, does complete and make perfect that week. “Complete/perfect” refers to the number seven, which defines the Sabbath day number. Thus a complete/perfect Sabbath may be understood as a “completing Sabbath”, i. e., a Sabbath that completes a seven day cycle. If seven continuous days does not end in the Sabbath, those seven days lack the perfection of ending in the seventh day. Thus “seven complete Sabbaths”, means “seven completing Sabbaths”, where a completing Sabbath is understood as a Sabbath that includes the six prior days. While a

week is implied, the emphasis is on the fact that the Sabbath makes a completion and perfection in its day number.

(3) Is there a biblical Hebrew expression for a full or complete week that does not involve the word Sabbath which could have been used if the Sabbath was not involved in a special way in the count to Pentecost? There is. The Hebrew phrase for a “full month” (or complete month) is literally translated “a month of days” in Num 11:20, 21; Deut 21:13; II Ki 15:13. Thus, by analogy, a complete week ought to be “a week of days”. Indeed this phrase “week of days” (meaning complete week) does occur in Dan 10:2 and 10:3, which the NKJV and KJV does show with the words “full” and “whole”. This shows that the usual way to mention a “complete week”, when the Sabbath is not involved, was not used in Lev 23:16.

(4) There is a count to 50 for the Jubilee year in Lev 25. In Lev 25:8 where it states “... seven Sabbaths of years...”, there is no reason to understand “Sabbaths” as meaning “weeks”. After counting the first six years, the count for the next year is both Sabbath year number one and year number seven. Repeating this for the next six years to again arrive at year 6, the count for the next year is both Sabbath year number two and accumulative year number 14. Continuing in this way, the count at Sabbath year number three is also accumulative year 21, the count at Sabbath year number four is also accumulative year 28, etc., until the count at Sabbath year number seven is also accumulative year 49. By counting Sabbath years (one through seven), each of which is the culmination of six ordinary prior years, one is indirectly counting 49 years, but the explicit direction from Lev 25:8 in counting Sabbath years from one to seven is perfectly fine and does not require one to translate the word “Sabbaths” as “weeks”.

(5) Making the analogy of patterning the count to the jubilee year with the count to the Feast of Weeks transfers the first six ordinary years to the first six ordinary days, and then the Sabbath year to the Sabbath day. Just as the jubilee year is the year after the seventh Sabbath year, Pentecost is the day after the seventh Sabbath day. This analogy would be broken if one starts the count to Pentecost on any day other than the first day of the week.

(6) The fact that one name of the feast is “Feast of Weeks” does not need to deny the use of the word “Sabbath” having been used multiple times in the description of the count in Lev 23:15-16. There is no context that requires the Hebrew word *shabat* in the Tanak to mean “week” or “seven”. There is a

different Hebrew word for week and a different Hebrew word for seven. There is no need to confuse the use of these words.

[99] Meaning of *omer* for Sheaf and its State of Development

The passage on the wave sheaf offering in Lev 23:10-16 contains the word sheaf [6016 *omer*] in Lev 23:10, 11, 12, 15. This Hebrew word occurs in the following ten other places: Ex 16:16, 18, 22, 32, 33, 36; Deut 24:19; Ruth 2:7, 15; Job 24:10. From Ex 16:36 we see that it is a dry measure of volume, but Ruth 2:7, 15 provide an alternate meaning, namely a sheaf of stalks with expected ears of grain. We are faced with the problem of resolving the ambiguity between the two meanings of *omer*.

Before examining the context of Ruth 2:7, 15 in some detail, the method of reasoning to resolve the ambiguity of the meaning of *omer* in the context of Lev 23 is now undertaken. While the Levitical priesthood existed and performed their ceremonies every year in Jerusalem until the Temple was destroyed in 70, this ceremony of the wave sheaf offering was witnessed by all people who attended the the Festival of Unleavened Bread. This ceremony continued to be performed every year, and with one united priesthood, their practice should not have changed through the centuries. People came to Jerusalem from great distances to be at this festival and thus see this ceremony, including Jews from Alexandria, Egypt, which was only about 200 miles away. Specialists in the Septuagint, the Greek translation of the Hebrew text, recognize that that its translators had a better command of the Greek language than of the Hebrew, and that the translation was undoubtedly made in Alexandria. Some of the Jews in Alexandria, possibly even some of the translators themselves, could surely explain what happened during the wave sheaf ceremony, so that the Greek translation could be accurate in its description. The Greek language does not have the ambiguity of the Hebrew language for the two meanings of the word *omer*. The Greek text uses one word, *gomer*, for the dry measure of the manna in Ex 16, and a different word, *dragma*, as the translation for *omer* in Deut 24:19; Ruth 2:7, 15 and the wave sheaf offering. This resolves the ambiguity of the meaning of *omer* in the context of Lev 23. All the uses of *dragma* in the Septuagint are listed on page 348 of Hatch and Redpath. If there existed any historical hint that the nature of the *omer* was a controversial issue at that time, then this would not resolve the question. But there is no such hint from before the destruction of the Temple, nor does Rabbinic literature hint that there was a debate over this.

Moreover, in Gen 37:7 where the Hebrew word for sheaves is *aluma*, Strong's number 485, its Greek translation in the Septuagint is also *dragma*. The Septuagint translation by Brenton for Gen 37:7 is: "I thought ye were binding sheaves [= *dragma*] in the middle of the field, and my sheaf [= *dragma*] stood up and was erected, and your sheaves [= *dragma*] turned round, and did obeisance to my sheaf [= *dragma*]." (Plural forms of *dragma* are used where the translation is plural.) **Thus a bundle of tied stalks is called a sheaf (*omer*).**

Ruth 2:7, "And she said, 'Please let me glean and gather among the sheaves [= *omer*] after the reapers.'" (This has the plural of *omer*.) Gleaning is gathering the grains still having their husks. The reapers swing the sickles that cut the stalks.

Ruth 2:15, "And she rose to glean. Then Boaz commanded his young men saying, 'Let her glean even among the sheaves [= *omer*] and do not rebuke her.'" (This has the plural of *omer*.)

Ruth 2:17, "So she gleaned in the field until the evening and beat out what she had gleaned, and it was about an ephah of barley." The beating was necessary to separate the husks from the grains.

On page 73 of H. L. Ginsberg 1982, he translates *omer* in Lev 23 as "armful", judging the quantity that might be tied into a bundle.

On page 506 of Danby's translation of the *Mishnah* in Menahot 10:4, talking about the wave sheaf ceremony and specifically the grains of barley (after they were separated from the husks), we find, "They put it in a grist-mill and took therefrom a Tenth [of an Ephah of flour] which was sifted through thirteen sieves." Danby added the explanation in square brackets, "a Tenth [of an Ephah of flour]". Ex 16:36 states, "Now an *omer* is one-tenth of an ephah." Danby is showing the common Rabbinic understanding that the *Mishnah* accepts the viewpoint that the Hebrew word *omer* means the dry measure quantity instead of the tied bundle of stalks. The *Mishnah* was published c. 200, which is about 130 years after the Temple was destroyed. This contradicts the understanding given above using the Greek word *dragma* from the Septuagint, which was translated long before the Temple was destroyed. The *Mishnah* has an incorrect interpretation.

The incorrect interpretation of *omer* from the *Mishnah* implies that the barley that was used in the wave sheaf offering was always ripe enough to

make flour. Even from the milky stage of development, the ears of barley are quite edible and have value. This was previously discussed when commenting on Luke 6:1. The use of the word “harvest” twice in Lev 23:10 will be discussed in the next chapter.

[100] Wave Sheaf Offering

Previous discussion has established that the day of the wave sheaf offering occurred on the morrow of the Sabbath, so that this morrow was a Sunday, and this Sunday fell within the seven Days of Unleavened Bread. The *omer* that was offered was a tied bundle of stalks of barley.

The Hebrew word *noof*, Strong's number 5130, has been typically translated “wave” as in wave sheaf offering in Lev 23:11, 11, 12, but as now seen in pages 461-473 of Milgrom, there is significant evidence to translate it “elevate” instead. However I will wait until I note some further scholarly consensus before I use this meaning.

The wave sheaf offering is mentioned in Lev 23:10-14; Deut 16:9-10. Here is a literal translation of Lev 23:10-14; Deut 16:9.

Lev 23:10, “Speak to [the] children of Israel and say to them, ‘When you come into the land which I am going to give to you and reap its harvest, then you shall bring [the] first [= *raysheet*] sheaf [= *omer*] of your harvest to the priest.

Lev 23:11, “And he shall wave the sheaf before YHWH for your acceptance on the morrow of the Sabbath the priest shall wave it,

Lev 23:12, “on [the] day that you wave the sheaf you shall offer a year old male lamb without blemish for a burnt offering to YHWH

Lev 23:13, “and a cereal offering with it, two-tenths [of an ephah] of fine flour mixed with oil, an offering by fire to YHWH, a pleasing odor and its drink offering of a fourth of a hin of wine.

Lev 23:14, “You shall not eat bread, nor roasted/parched-grain, nor fresh grain until this same day, until you have brought [the] offering of your Almighty. It is a statute forever throughout your generations in all your dwellings.”

Deut 16:9, “Seven weeks you shall count for yourself from [about the time] you begin [to put the] sickle to standing grain, you shall begin to count seven weeks.”

In Lev 23:10 the phrase “when you come into the land” is often used in the special sense of “from the time that you come into the land onward”, not specifically “when you come into the land for the first time”. This is seen in the following examples: Lev 14:34; 19:23; 25:2; Nu 15:2; Deut 17:14; 26:1.

Lev 23:10 mentions harvest [7105 *ketseer*] twice. This word occurs on page 894 of BDB where three meanings are derived from the biblical contexts: (1) “process of harvesting”; (2) “what is reaped, harvested, crop”; (3) “time of harvest”. The second meaning is often overlooked. Consider some examples.

In the context of a foreign nation that will come and concur Israel, Jer 5:17 reads, “And they shall eat up your harvest [= *ketseer*] and your bread, which your sons and daughters should eat. They shall eat up your flocks and your herds. They shall eat up your vines and your fig trees. They shall destroy your fortifies cities, in which you trust, with the sword.” These various foodstuffs have previously been harvested and then stored, though some of it has been eaten since the time of harvest. This verse shows that the invaders shall eat the stored food at the time of the invasion. Here the stored food, that is, what remains of the crop, is called the harvest.

Another way of describing a foreign invader is in Isa 17:11, “In that day you will make your plant to grow, and in the morning you will make your seed to flourish. But the harvest [= *ketseer*] will be a heap of ruins in the day of grief and desperate sorrow.” Here the word harvest refers to the crop as it is still growing at the time of the invasion. In this sense the word harvest simply refers to the crop in its current state before the time of typical general reaping.

Joel 1:10, “The field is wasted, the land mourns. For the grain is ruined, the new wine is dried up, the oil fails.”

Joel 1:11, “Be ashamed you farmers, wail you vine dressers, for the wheat and the barley, because the harvest [= *ketseer*] of the field has perished.”

Again the word harvest refers to the crop, but not the time of normal harvest.

When considering the phrase “and reap its harvest” near the beginning of Lev 23:10, keep in mind that the normal time to begin the barley harvest varies according to the location in Israel. This variation stretches over a seven-week period. It is not the moment of general harvest for the majority of Israel. The ceremony described in Lev 23:10 is based upon reaping a first

[= *raysheet*] bundle of stalks of barley, an *omer*. The grains on those stalks may be in any of several stages of development from the edible milky phase to the ripe stage when flour may be ground. All of these stages are useful. Recall Luke 6:1 where grains were picked from the stalks and comfortably eaten raw.

The differences between Lev 2:14-16 versus Lev 23:10-14; Deut 16:9-10 are:

(1) Lev 2:14-16 begins with “if” and it pertains to those who own a grain crop. But the wave sheaf offering is a collective plural obligation of the children of Israel. The wave sheaf offering is from barley because it is the first of the harvest, but no specific kind of grain is indicated in Lev 2:14-16.

(2) Lev 2:14-16 mentions *aviv* but Lev 23:10-14; Deut 16:9-10 does not. I do not necessarily attach any specific significance to this, but am simply noting differences in wording. Any stage of grain for firstfruits [= *bikurim*] is indicated in Lev 2:14, and similarly any stage may be used for the wave sheaf offering. As previously discussed, *aviv* does not show any specific stage of grain.

(3) In Deut 16:9 “standing grain” is translated from the single Hebrew word *kamah*, Strong's number 7054. This word was already discussed in the introductory chapter on *aviv*. The flexibility of this word makes it difficult to draw any conclusions from its use in the immediate summarized context. The key question concerning Deut 16:9 is whether the specific use of this cut standing grain can be demonstrated from this summarized context, or even from the directly related context of Lev 23:9-16. The Tanak is silent on this. However, there is nothing explicitly said that prohibits the use of the wave sheaf offering for food after the ceremony is performed. That is under the jurisdiction of the priesthood.

(4) Lev 2:15-16 tells what is to be done with the preparation from Lev 2:14. Most of it is consumed as a firstfruits offering. In contrast to this, Lev 23:12-13 tells what is to be done with preparations different from the wave sheaf offering itself! There are no instructions of what is to be done with the wave sheaf offering itself after the ceremony.

(5) Lev 2:14 mentions firstfruits (= *bikurim*, discussed above) twice, but Lev 23:10-14 does not have this word, and neither does Deut 16:9-10! The offering of Lev 2:14-16 must come after the sheaf of Lev 23:10 is cut because Lev 23:10 has the word “first”, and Deut 16:9 has the word “begin”.

The wave sheaf offering is not called *bikurim* (firstfruits) even though it must come first! The reason for this may well be that *bikurim* for a grain offering has a highly specific method of use stated in Lev 2:14-16, and the context of Lev 23:10-14 does not show such a method. In Lev 23:10 the word *raysheet* is used, and it is hazardous to employ a subjective decision to translate this with the same word “firstfruits” and thereby appear to equate *bikurim* with *raysheet* in these contexts, although there are distinctions between these words as previously discussed in the chapter on firstfruits. Both Tanakh-JPS and Tanach-Stone translate *raysheet* as “first” in Lev 23:10.

(6) Lev 2:14-16 compared to Lev 23:10-14; Deut 16:9-10 have vastly incompatible descriptions in their formulas of procedure, and the Hebrew technical terms that are used to describe them are different, so there is no need to assume that the *bikurim* (firstfruits) offering of Lev 2:14-16 governs the offering of Lev 23:10-14.

[101] How the Wave Sheaf was Obtained

Lev 23:10 “Speak to [the] children of Israel and say to them, ‘When you come [plural form of the verb come] into the land which I am going to give to you and reap [plural form of the verb reap] its harvest, then you shall bring [plural form of the verb bring] [the] first sheaf of your harvest to the priest.’”

This definitely does not say that the priest goes out to look for the sheaf (the bundle of stalks, *omer*). Instead it says that “you”, the farmers, are to bring it to the priest. The Hebrew verbs for “you come”, “reap”, and “you shall bring” are in the plural form - see AKOT where the grammatical form of every verb is given. This is similar to the English verb “to be”, in which one writes, “I am”, “he is”, and “they are”, so that the form “are” is plural.

It definitely does not say that only one farmer brings the wave sheaf. This is being spoken to all the children of Israel, not merely to those where the barley is furthest in development. The wave sheaf ceremony occurs on the Sunday during the seven Days of Unleavened Bread as previously discussed along with Josh 5:10-12.

Since the wave sheaf ceremony occurs during the Festival of Unleavened Bread, and at this time all the men were required to already be at one central

place in Israel keeping this feast (Deut 16:16), in order for the farmers to bring it the distance from the field where it grew to the priest at this festival, it must have been cut by the farmer before leaving for the feast. The context definitely does not say that the barley that is brought by each farmer can only be brought if it has reached some specific stage of growth.

[102] More Comments on the Time of Early Ripe Barley in Israel

I have already quoted from the personal experiences of Gustaf Dalman concerning the time of the barley harvest in Palestine. Some other sources are now tapped.

On pages 44-45 of Carpenter (who has translated from the Latin of J. D. Michaelis) we find, “Besides, all who in their travels [in Palestine] mention the time of harvest, tell us that corn [grain or barley] grows ripe, and is mowed, in the months of April and May. Rauwolf says, that the harvest commences in the beginning of April; but he is to be understood according to the old [Julian] calendar, and to say that about the tenth of our [Gregorian] April N.S. [new style] the sickle is first put into the early ripe fields of Palestine.”

On pages 362-363 of Thomson we find, “I have visited the pilgrims’ bathing-place, the supposed scene of this miracle, early in April, and found barley-harvest about Jericho already ended. I also found the [Jordan] river full to the brim, and saw evidence in abundance that it had overflowed its banks very recently [Josh 3:15]. Barley-harvest in the vale of the Lower Jordan begins about the end of March. This seems early, and in fact it is long before the crops are ready for the sickle on the neighboring mountains, or even around the fountains of the Upper Jordan. But the reason is obvious. The valley at Jericho is thirteen hundred feet below the level of the sea, is sheltered from cold winds on all sides by mountains of great height, and is open to the warm southern breeze from the basin of the Dead Sea. It has, therefore, the climate of the tropics, though in the latitude of Jerusalem.”

On pages 487-488 of Ideler we find the following (my translation from the German), “According to the writings of journeys, the accounts of which were collected by Michaelis and exhaustively by Buhle, the barley at the border of Jericho, the warmest region of Palestine, generally reaches to maturity in the first days of our April. From this time onward, when the first ears were offered, one is permitted to begin the harvest, and this continues in

the suitable parts of the land to the north near Lebanon until into the last half of May. Hence, here in Palestine the barley begins to ripen about 14 days after the vernal equinox, so we note that the Ears-Month would have begun according to Moses' determination approximately with this time of the year, if it was to be gauged according to the sun."

[103] Can the Barley Harvest begin before the Wave Sheaf Offering?

Is there evidence that the reaping of the barley harvest could not start until the wave sheaf offering had been made? To help answer this question, let us review and compare a literal translation of two passages.

Deut 16:9, "Seven weeks you shall count for yourself from [about the time] you begin [to put the] sickle to standing grain, you shall begin to count seven weeks."

Lev 23:15-16, "And you shall count for yourself on the morrow following the Sabbath, from [the] day you brought the sheaf of waving [to the priest], seven complete/perfect Sabbaths they shall be, until on the morrow following the Sabbath the seventh, you shall count 50 day[s], and you shall present a new offering to YHWH." Here the Hebrew phrase *me-macharat*, meaning "on the morrow following", occurs twice.

The following aspects of Deut 16:9 point out its incompleteness and the omission of details in comparison to Lev 23:15-16.

- (1) It makes no mention of 50 days, or even any specific number of days, but instead simply "seven weeks", which is only a rough summary of the days of the count.
- (2) It makes no mention of the ending day of the count.
- (3) It makes no mention of "Sabbath", thus omitting further detail.
- (4) It makes no mention of the phrase "on the morrow following".
- (5) It makes no mention of the sheaf (*omer*).
- (6) It does not mention anything about the role of the priest or some ceremony involving the sheaf, and while this is not mentioned in Lev 23:15-16, it is mentioned in Lev 23:10.
- (7) It makes no mention of not eating any of the new crop until the day of the wave sheaf offering in contrast to Lev 23:11, 14.

The above comparison shows that Deut 16:9 is a rough summarized statement without precision. The major omissions are the first two aspects

regarding the count. However, another significant lack is that where there are English words added in square brackets in the above literal translation of Deut 16:9, if no words are added between “from” and “you”, and if no words are added between “begin” and “sickle”, the thought is not complete. The words that need to be added are open to question, but whatever words are added, they must be in harmony with the thoughts expressed in Lev 23:10-16. The omissions in Deut 16:9 make it secondary to Lev 23:10-16. It is Lev 23:10-16 that controls the understanding of Deut 16:9, not vice versa.

The question arises as to what specifically must be added to Deut 16:9 in order for it to express a coherent unbroken thought that allows Lev 23:10-16 to control the subject.

Deut 16:9 forces the translator to add the words “about the time”, because the day that the farmers cut the first sheaf was before they departed for the Festival of Unleavened Bread, not the day they presented it to the priest.

Since each individual farmer had his sheaf cut before leaving for the feast, and it took each of them some time to travel, the sheafs were not all cut on the same day. Undoubtedly many priests participated in the wave sheaf ceremony because there were many farmers. Nothing in Scripture requires that the day of cutting the first sheaf for any specific farmer also be the day that the farmers presented it to the priest.

The only statement that makes a prohibition is Lev 23:14, “You shall not eat bread, nor roasted/parched-grain, nor fresh-grain until this same day, until you have brought [the] offering of your Almighty.” Hence there is no requirement that the standing grain that the individual farmer wants to harvest (if any) before he leaves for the feast must be left standing. Thus the safety of the crop is not threatened by early ripeness in certain areas before the feast of unleavened bread!

The day to start the counting of seven weeks is not clearly indicated in Deut 16:9, but only from Lev 23:15-16 can we know that it was from the day of the wave sheaf offering, not from the day each farmer cut the sheaf in advance of leaving for the feast. Since each farmer had to cut his sheaf in advance of the day of the wave sheaf offering, is there any limitation of how far in advance the farmer may cut the sheaf that he planned to take to the feast for the wave sheaf ceremony? Scripture is silent on this. Once the farmer did cut this particular sheaf first and set it aside for safe keeping to be

brought to the feast, is there any Scripture that forbids the farmer from harvesting additional grain before he leaves for the feast?

Since Lev 23:10 mentions “your harvest” and wild barley neither provides a high yield for the effort nor has desirable qualities for normal use, wild barley would not qualify for “your harvest” unless it was a time of famine. Only domesticated barley was intended for the wave sheaf offering. However there is no reason why the word *aviv* cannot include wild barley.

When I spoke with Dr. David Marshall, a barley and wheat geneticist from Texas A & M University in 1992, he told me that when he visited Egypt, the farmers who still used a sickle waited until the barley was at 30 percent water content or less before harvesting. This was about the first time at which flour could be obtained. This was by experience rather than a scientific measurement, but Dr. Marshall knew the water content. They could wait some weeks and let the water content decrease, but they could not let it get near 10 percent because at that point only modern machinery could harvest it without shattering and losing the grain. But winter barley that lies dormant over the winter ripens slowly because the temperature rises slowly. They have some weeks to wait before they will lose it to shattering. A primary difference between wild barley and domesticated barley is that domesticated varieties are bred to enable the grain to stay on the stalk for a much longer time before shattering than wild barley. Wild barley does shatter soon after ripening, but not domesticated barley.

Some Added Conclusions

(1) The literal Hebrew words present in Deut 16:9-10 does not forbid the Israelite farmer from harvesting his crop before the wave sheaf offering. Once the farmer has cut and put aside the first sheaf, he may reap his crop. He may harvest the crop before leaving for the Feast of Unleavened Bread. Thus the crop is not at risk based upon the day of the wave sheaf offering.

(2) The day of the wave sheaf offering may be thought of as a man having a long leash with a dog at the end. The dog represents the ripening of barley which can wander a little this way or that, but not too far from the day of the wave sheaf offering. Barley in Israel ripens over a seven-week period depending on the location, so that the word *aviv* is not descriptive of only one month. It takes a more precise astronomical method to pin down the month of *aviv* to one month.

(3) Gen 1:14 ends in the word “years”, so that the lights in the heavens determine years. Moses evidently did not think it was important to describe the astronomical method to define years because the vernal equinox was common knowledge in Egypt where the Israelites had been, being witnessed by the greatest pyramids of Egypt. Heat is the major factor that determines the time of the ripening of winter barley, not light. Lights are mentioned repeatedly in Gen 1:14-16, never heat.

[104] The Meaning of Deut 16:1

In order to arrive at a proper understanding of a biblical subject or verse it is necessary to first understand the clear Scriptures and then use information from them to eventually understand the unclear ones. Deut 16:1 is an unclear Scripture for at least the following reasons:

(1) The first Hebrew word in Deut 16:1 is *shamar*, Strong's number 8104, which has a variety of possible meanings depending on the context. It primarily may mean “to keep [a law]”, “to observe [by sight]”, “to preserve or protect”, “to celebrate [a festival]”, or “to guard [captives]”, and some of these meanings can overlap or blend. There is debate over the meaning of *shamar* in Deut 16:1.

(2) Considerable effort has been expended above to show that *aviv* means “ears [of grain]” regardless of the stage of ripeness of the ears. But some references have taken the Talmudic interpretation of *aviv* as “the milky phase of grain” as if this constituted the full scope of its original meaning. Without a thorough study of Ex 9:31 and the hail plague in Egypt in its agricultural, historical, climatic, and geographical context as well as the use of *aviv* in the Dead Sea Scrolls, one can not appreciate the full scope of the meaning of *aviv*, and this misunderstanding of *aviv* has perhaps been the primary cause of confusion over the meaning of Deut 16:1.

(3) Deut 16:1 may be divided into two parts, the first designated 16:1A and the second 16:1B. The Hebrew word *chodesh*, Strong's number 2320, occurs in both parts. This word either means “new moon” or “month” depending on the context. The full Hebrew expression in which *chodesh* occurs here is “*chodesh ha aviv*” which means either “the new moon of *aviv*” or “the month of *aviv*”. This exact Hebrew expression occurs six times in Scripture: Ex 13:4; 23:15; 34:18A, 18B; Deut 16:1A,1B. The context of the five places other than Deut 16:1A show it to mean “month of *aviv*”. Is it plausible to think that in Deut 16:1A this expression means “new moon of *aviv*” but in the second half of the same verse (and everywhere else), the same

expression has a different meaning? Some people think it is plausible, but in my opinion it is quite unlikely for the expression to change its meaning in only the first half of the verse.

(4) Another controversial question about the translation of Deut 16:1 involves whether the Hebrew word *aviv* should be translated to emphasize its meaning or to indicate the name of the month, and this depends on the original intent of the first part of the verse. If the first part of this verse is intended to describe an activity of visual searching as some teach, then the word *aviv* should most likely be translated to emphasize its meaning. However, in ancient times a name typically did have meaning, so that *aviv* can indicate both a name and meaning. It is a descriptive name because the meaning alone applies to several months.

Now that four points of controversy concerning the translation of Deut 16:1A have been elucidated, it should be clear to the reader that one should not start the study of how to determine the first month with a forced interpretation of this verse. An edifice should be built on a firm foundation, not one that is conceived in debate. In other words the claim is made by some that this verse should start, “Observe [by sight] the new moon of [in which you find] nearly ripe, green ears ...” Notice that the added expression “in which you find” is not based on any Hebrew words from Deut 16:1, but is nothing more than a forced wishful interpretation upon the text. This interpretation involves a controversy over the intended meaning of *shamar*, a controversy over the intended meaning of *aviv*, a controversy over the intended meaning of *chodesh*, and a controversy over whether *aviv* should be translated into its meaning or transliterated as the name of a month. Beyond these four matters of controversy is the issue of adding the expression “in which you find”, so that the belief of “physically searching for *aviv*” is read into the text, and then this text is used as alleged evidence for this practice to determine the first month.

The clearest way to refute this alleged interpretation of Deut 16:1A is to recognize that *aviv* means “ears [of grain]” regardless of the stage of ripeness of the ears. One does not go looking for something that has a wide scope of meaning, otherwise one does not know what to look for. Hence adding the expression "in which you find" is a fallacy as an implied translation. Consistency in translating the expression *chodesh ha aviv* within Deut 16:1 requires that *chodesh* mean “month” here. Deut 5:12 also starts with the word *shamar* and means, “Keep [the laws of] the Sabbath day to set it apart ...” Similarly Deut 16:1 means, “Keep [the laws of] the month of

aviv and perform the Passover ...” The laws of the month of *aviv* include the laws of the Passover.

The presence of the Hebrew word *chodesh* in Deut 16:1A thwarts the attempt to make to mean, “Observe [by sight] the nearly ripe, green ears ...” because *chodesh* stands as a barrier between “observe” (*shamar*) and “*aviv*”. Besides, *aviv* has a wider range of meaning than this and the time at which barley comes to maturity ranges over a seven week period throughout Israel. Hence observing is not confined to merely one month as though this meant “Observe [by sight] the month of nearly ripe, green ears ...” When using an accurate translation of *aviv*, the meaning, “Observe [by sight] the month of ears ...” still does not make sense because “ears” spans several months from the earliest stage to the last of the harvest.

[105] The First Month During the 40 Years of Wandering in the Wilderness

Num 9:1-14 describes the keeping of the passover in the wilderness during the first year after the Israelites left Egypt. In order to do this during the 40 years in the wilderness they would have to determine when the first month began.

Num 9:15, “Now on the day that the tabernacle was erected, the cloud covered the tabernacle, the tent of the testimony, and in the evening it was like the appearance of fire over the tabernacle, until morning.

Num 9:16, “So it was continuously, the cloud would cover it by day, and the appearance of fire by night.

Num 9:17, “And whenever the cloud was lifted from over the tent, afterward the children of Israel would then set out; and in the place where the cloud settled down, there the children of Israel would camp.

Num 9:18, “At the command of YHWH the children of Israel would set out, and at the command of YHWH they would camp; as long as the cloud settled over the tabernacle, they remained camped.

Num 9:19, “Even when the cloud lingered over the tabernacle for many days, the children of Israel would keep YHWH's charge and not set out.

Num 9:20, “If sometimes the cloud remained a few days over the tabernacle, according to the command of YHWH they remained camped. Then according to the command of YHWH they set out.

Num 9:21, “If sometimes the cloud remained from evening until morning, when the cloud was lifted in the morning they would move out; or if it remained in the daytime and at night, whenever the cloud was lifted, they would set out.

Num 9:22, “Whether it was two days or a month or a year that the cloud lingered over the tabernacle, staying above it, the children of Israel remained camped and did not set out; but when it was lifted, they did set out.

Num 9:23, “At the command of YHWH they camped, and at the command of YHWH they set out; they kept YHWH’s charge, according to the command of YHWH through Moses.”

Notice in verse 22 that even if the cloud lingered for a year, they remained camped. Their coming and going was strictly governed by the cloud by day and the fire by night over them during the 40 years. The only exception was when the 12 spies were sent out, which occurred before the announced 40 year punishment of wandering in the wilderness (Num 14). There is no hint that they violated the rule of remaining with the miraculous cloud and fire by sending search parties into Israel to seek *aviv* to determine the first month during the 40 years.

[106] Indirect Interpretation of Gen 1:14 and the Jews in Rome

It has been proposed that Gen 1:14 be interpreted so that the sun indirectly affects the barley which in turn causes the time of the first month. But Gen 1:14-16 mentions lights of the heavenly bodies, not heat. It is the heat from the sun that causes winter barley to ripen. The angle at which the sun's rays enter the atmosphere causes the heat. This angle is determined by the nearly constant axis on which the earth rotates in comparison to the plane of the earth's orbit around the sun. The trade winds and the rain also affect the temperature which affects the barley, not only the sun with the constant axis of the earth. A prolonged lack of rain also hastens the ripening of barley. Hence this interpretation of Gen 1:14 that the light of the sun indirectly determines the first month does not properly consider all the factors and it is very doubtful that Gen 1:14 was intended to be understood this way. The question is this: What Scripture provides substantive evidence for the interpretation that an examination of barley determines the first month? The relevant parts of the Tanak have been investigated, including Ex 9:31-32; Lev 2:14-16; 23:10-16; Deut 16:1, 9-10 and the phrase *chodesh ha aviv*. Attempts to consider using barley introduces confusion in practical definitions regarding the arbitrary botanical investigation of barley, the wild and domesticated varieties of barley, whether artificial irrigation must be excluded, and the places within Israel to look for it. The directness of Gen 1:14 as a cause and effect verse must be given priority. Philo of Alexandria attributes the vernal equinox as the cause of the first month. Josephus

mentions the sun being in the fixed sign of the zodiac named Aries as a cause, which is astronomical rather than agricultural. Lev 23:10 states that the Israelites bring the *omer* to the priest, not that any priests go searching for barley. All the reasoning associated with barley as the alleged cause of the time of the first month is imaginative.

In Gen 1:28 we see the command to “Be fruitful and multiply, and fill the earth”. In order to keep the Days of Unleavened Bread during the first month while filling the earth, one had to have means for knowing when to do this when far from Jerusalem. Concerning the keeping of Pentecost, in Acts 2:10 we note that festival visitors came from “the districts of Libya around Cyrene, and the sojourning Romans, both Jews and proselytes”. A major Jewish settlement around Cyrene was 800 miles from Jerusalem. Rome was about 1500 miles from Jerusalem. While this relates to Pentecost rather than the Days of Unleavened Bread, going to Jerusalem for a seven day festival would be more desirous than for the one day festival of Pentecost. Even those who could not make the long and expensive journey from Rome would still want to observe the Days of Unleavened Bread locally. In commenting on Acts 2:10, page 63 of Bruce states, “There was a Jewish colony at Rome in the second century B.C., and it was augmented by the Jews who were brought there from Palestine in 62 B.C., to grace Pompey's triumph, and later set free. We have references in Roman inscriptions to at least seven Jewish synagogues in Rome.”

It would have been a significant problem for news about barley just prior to the first month to reach Jews about 1500 miles away in Rome in time for the Days of Unleavened Bread for local observance in Rome. This problem is far worse for a person who wishes to travel from Rome to Jerusalem to keep the feast there after hearing the news about the barley in Rome. While hypothetical high speed runners and fire signals might be employed in getting news to Rome in time, this does not help people who want to travel from Rome to Jerusalem to keep the feast after finding out that the month which recently began is the first month. On page 149 of Casson 1974, we read, “To go from Italy to Spain by land would have taken a month, to Alexandria [Egypt] well-nigh two.” On page 150 Casson writes, “For travelers heading for the eastern Mediterranean [by ship] from anywhere within the western part of the empire, Rome was far and away the best jump-off point.” On page 123 of Casson 1994, we read, “Except for emergencies, the ancients limited their sailing to the season when the weather was most dependable, roughly from the beginning of April to October. The winds over

the waters between Rome and Alexandria during this period blow prevailingly from the west. This meant that the voyage from Rome, made with a favourable wind all the way, was quick and easy, taking normally no more than two to three weeks.” On page 124 Casson explains that if a person wanted to go from Rome to Palestine, the best choice would be to get on a grain freighter from Rome to Alexandria, and then make the remaining 200 mile journey by land or sea. In summary, if a man left Rome by ship on April 1, which is the earliest time in the year that a ship would leave, he stood a reasonable chance of reaching Jerusalem by May 1. In most years this is too late for passover. Since a Jew would not want to travel on the Sabbath, it would take about two months to travel from Rome to Jerusalem by land. In any event, news about barley would not come in time to help the Jew from Rome to know when to leave for Jerusalem.

Only an astronomical method that would allow the Jews in Rome to know the first month for themselves would make sense, and this is in harmony with a direct understanding of Gen 1:14.

[107] History of the Karaites

There are Jews in different parts of the world today that call themselves Karaites. The Karaites in Israel today use barley alone to determine the first month. Since many people receive emails from them, we now devote some space for a brief discussion about their history and the calendar.

Page 20 of Ankori states: “Ever since the famous century-old theory of Geiger linked the early Karaites with the internal conflicts of the Second Jewish Commonwealth, scholars did not cease to detect ancient antecedents in Karaite ideology. Geiger and his successors hailed the Karaites as spiritual heirs, nay, actual survivors, of the seemingly extinct Sadducee party. On closer analysis, however, Sadduceeism in its classical definition seems to have played in the Middle Ages the role of a haunting historical recollection rather than an actual source of influence, an amorphous symbol of dissent rather than a definitive sectarian identity.”

On page 777 of Gil we find, “The origins of the Karaites and their early development are shrouded in obscurity. The sources which describe these beginnings single out the figure of ‘Anan, who is considered the founder of Karaism.” On page 778 we read: “As to the Karraite sources themselves, Qirqisani says that 'Anan lived in the days of the second Abbasid caliph, the

founder of Baghdad, Abu Ja'far al-Mansur (754-775), which fits what has been said above.”

On page 22 of Schur (1992) we see, “Modern research does not accept the traditional Karaite version, which regards Anan unreservedly as the founder of the Karaite sect. Most scholars stipulate now the existence of two separate groups:

- * the Ananites, followers of Anan and sometimes actually members of his family;
- * the Karaites, who were the outcome of the coalescence of various sectarian groups.”

On page 211 of Schur (1995) we find, “Now that Anan's real position in Karaite history begins to be better understood, Benjamin Nahawendi looms much larger, as he was the first real leader and unifier of the sects which eventually made up Karaism. He hailed from Nihavend in Persia (in the province of Media), and might have lived (in the first half of the ninth century) in Persia or in Iraq.” Page 213 states: “Nahawendi’s importance is attested to by medieval Arabic accounts, which call the Karaites ‘the followers of Anan and Benjamin’. Saadia Gaon and Judah Halevi regarded Anan and Nahawendi as the two founders of Karaism.”

On page 448 of Ben-Sasson we find, “The diversity between the Karaites themselves resulted from the rationalistic individualism of this trend in the tenth century.” Page 449 states, “According to the Karaites, the individual is duty bound to rely on his own intelligence and to understand the Holy Scriptures independently.”

The Karaite named Levi ben Yefeth wrote a book about 1006-7 in which he mentions three prevalent views of how to determine the first month. This is reported on pages 303-304 of Ankori. The first view he presents is that of the Rabbanites who use the modern calculated Jewish calendar. The next quotation from pages 303-304 has square brackets with words added by Zvi Ankori in the midst of his translation from Levi ben Yefeth, where we read, “The second group consists of people in the Land of Shine'ar [= Babylonia] from among our brethren the Karaites. They follow the [computation of the vernal] equinox alone; yet, they stipulate certain conditions which are different from those stipulated by the Rabbinates. This is why we have listed this group as separated from the Rabbinates Now, this second group does not inquire, nor search, for the abib at all; [its members simply] wait and do

[the proclamation of Nisan] when the sun reaches the Constellation of the Ram....”

In the Middle Ages the Constellation of the Ram meant the 30 degree segment of the zodiac beginning with the vernal equinox, not what it meant to Pliny the Elder and Josephus, and not the actual star group that formed the constellation.

Next, on page 304, Zvi Ankori, continues his translation: “The adherents of the third group [i. e., the Palestinian-oriented Karaites] observe [the New Year] on the strength of abib alone and they do not investigate [the position of] the sun at all.”

The following paragraph appears on page 326 of Ankori: “Thus, in the case of an unusually early ripening of barley in Palestine, the twelfth month of the Karaite calendar-year, Adar, would yield to Nisan, the first month of a new year. Indeed, an actual occurrence is cited when the Purim Festival, due to fall, as a rule, in the middle of Adar, was shelved altogether to make way for Passover, which falls in the middle of the succeeding month of Nisan.” Footnote 66 places this in the year 1006-1007. In Est 9:19-23 it is clear that the Jews had decided that every year on the 14th and 15th days of the 12th month Adar they would celebrate Purim. Hence they understood that every year had to have at least 12 months, but the Karaites who used barley apparently accepted the viewpoint that some years might only have 11 months based on the state of the barley.

In Poland today (and scattered elsewhere in eastern Europe) there are Karaites that follow the second group above which uses the vernal equinox and not the barley to determine the first month.

In discussing the Karaites, pages 392-393 of Nemoy state, “Some of them begin the ‘(month of the) fresh ears’ (with the appearance) of (any kind of) green herbage, whereas others do not begin it until (fresh) garden-cress is found all over Palestine; others begin it only when (at least) one piece of ground becomes ready for harvest; still others begin it even when only a handful of corn is ready for harvest.” This indicates that Karaites in the Middle Ages who wanted to use vegetation to determine the first month could not agree among themselves on the method, undoubtedly because the Bible does not provide a botanical description for the month of *aviv*.

[108] Issues Against the Position that Barley Determines the First Month

(1) Ex 9:31-32 in its context shows that *aviv* includes a multitude of stages of the growth of the ear of barley. One text in the Dead Sea Scrolls shows it to mean fully ripe ears. With such a variance in the inclusive meaning of *aviv*, how can it be used to determine the first month?

(2) The presence of *aviv* in Israel applies to several months from the meaning of *aviv*, so that its name does not uniquely determine a month.

(3) Since Moses never went into Israel and did not know when barley grew through its various stages there, and since the stages of barley growth in Egypt occur at a different time from the stages of barley growth in Israel, how would he know to think about barley growth in Israel in relation to the first month at the time that Ex 12:2 was told to him given that there is no mention of barley or *aviv* in the immediate context of Ex 12:2?

(4) Although there is evidence that the wave sheaf offering should be performed with domesticated barley rather than wild barley, there is no evidence that the general meaning of *aviv* must be restricted to domesticated barley. The word *aviv* does not occur in contexts of the wave sheaf offering. How does one use the Bible to decide whether to use wild or domesticated barley in any proposed definition to use *aviv* to define the first month?

(5) If a proposed definition of barley is used to determine the first month, what would prevent a year from having eleven months, and how should this be accepted in light of Est 9:19-23?

(6) Since “month of *aviv*” does not mean “month of first *aviv*” and several months show *aviv*, how does one decide the month of *aviv* from the word *aviv*?

(7) Num 9, especially verse 22, shows that Israel did not search for *aviv* in Israel to determine the first month during the 40 years of wandering in the wilderness. This is a type of how people all through history from that time onward who wanted to keep the festivals were expected to use a different method from searching for *aviv* to determine the first month, especially in view of Deut 30:11-14. Similarly, Karaites in Babylonia about 1000 CE used the vernal equinox and ignored the barley; they were too far away from Israel to use barley, and it is not known that they would have used barley if they could have known its status.

(8) In the first century it would have been a significant problem for news about barley just prior to the first month to reach Jews about 1500 miles away in Rome in time for the Days of Unleavened Bread for local observance in Rome. This problem is far worse for a person who wishes to travel from Rome to Jerusalem to keep the feast there after hearing the news

about the barley in Rome. While hypothetical high speed runners and fire signals might be employed in getting news to Rome in time, this does not help people who want to travel from Rome to Jerusalem to keep the feast after finding out that the month which recently began is the first month. If using barley is the proper method, what advice does one give to the Jew in Rome who wants to go to Jerusalem for passover?

(9) What Scripture is strong enough to overturn the direct cause and effect statement in Gen 1:14 that the lights in the heavens are for festivals and years? Neither Lev 23:10 nor Deut 16:9 provides a direct statement that the wave sheaf offering determines the first month.

(10) Ezra 6:15 and Neh 6:15 tie in with Gen 1:14 to give the biblical and archaeological evidence that together show explicit evidence that Gen 1:14 involves the vernal equinox so that the first month begins on or after the vernal equinox. The Hebrew word *tkufah* can mean equinox or solstice.

(11) Philo of Alexandria explains Gen 1:14 and Ex 12:2 without the use of barley, and with the use of the vernal equinox. He makes a reference to the vernal equinox as used by other nations which would necessarily be the continuation of the Babylonian calendar which did not allow the first month to precede the vernal equinox. Josephus also uses an astronomical expression rather than an agriculture to indicate the placement of the first month.

(12) The ripening of winter barley is caused by heat, not light. This heat is a result of the angle of the sun's rays of light to the earth, and the angle originates from the fixed axis of the earth to the plane of the earth's orbit. Hence the cause of ripening of winter barley is not the light from the sun. Thus the light from the sun is not the indirect cause for the first month. Gen 1:14 does not mention heat, which is really the primary direct cause for the ripening of barley. Gen 1:14 does not show any use of barley to determine the first month because it mentions light, not heat.

[109] Epilogue

(A) Condensed Summary

The uncovering of the biblical calendar through Scripture itself has been a challenge, yet it was attained by using ancient Semitic languages, archaeology, agricultural studies, and the history of ancient astronomy mingled with modern mathematical astronomy and computers. Thus the breath of life entered obscure Hebrew words, phrases, and contexts. The conclusion is a very simple natural calendar that requires no mathematics.

The authority to teach the Israelites and to blow two silver trumpets to officially announce the natural calendar's new month based on the sighting of the new crescent was in the hands of the Levitical priesthood. This priesthood questioned witnesses concerning their claims to having seen the new crescent. In the mouth of at least two witnesses the priesthood could accept evidence that the new month had begun on the day of that sighting. At some time not long after the Temple was destroyed in 70, the priesthood ceased to function and the determination of the calendar fell into hands that had no authority to announce the start of a month or to determine which month was the first.

When the Israelites left Egypt, the determination of the vernal equinox was well known and did not require any mathematics. The orientation of the greatest pyramids of Egypt are a witness to their ability to determine the vernal equinox. Moses was trained well in the knowledge of the Egyptians, and this included the ability to determine the vernal equinox using the shadow based on the sun. The new moon that was announced on or first after the day of the vernal equinox was the first new moon of the biblical year.

(B) Summary of the Biblical Calendar from Scripture

The appointed-times and years are determined by *lights* in the sky (Gen 1:14-15). In Lev 23 the appointed-times are defined using the elements of the calendar (the first month, counting months, counting days, and counting the cycle of the Sabbath). Thus the elements of the calendar are determined by the lights in the sky. Gen 1:14-18 repeatedly mentions *lights* and never mentions heat or plants. Plants that are capable of natural growth during each segment of the year in each locality of the earth are specifically determined by heat (the normal temperature range) and water. While there does need to be some light making its way through the clouds to supply energy for photosynthesis, the precise length of daylight each day hardly matters for the time of planting and reaping. The basic keys for the annual agricultural cycle are heat and water. Because Gen 1:14-18 mentions *lights*, and never heat or water, it is an astronomical context, not an agricultural context. Gen 1:14-18 declares that elements of astronomy defined by light, not agriculture, determine the calendar unless there is clear evidence to the contrary elsewhere in the Tanak. The emphasis on lights shows that observation rather than calculation was the basis for the biblical calendar. This implies that no calculation of the astronomical new moon (conjunction)

was involved for the calendar. A complete study of I Samuel 20 shows that it was not known in advance whether a biblical month would have 29 or 30 days, so that the start of a month was not based upon calculation.

Gen 1:16-18 mentions the rulership or dominance of the two great lights and the stars. Ps 136:7-9 shows that the two great lights are the sun and the moon. Thus Gen 1:16-18 must refer to the sun and moon, with the stars mentioned at the end. Ps 104:19 also shows that the moon determines appointed-times, although it does not say that the moon is the only body involved, and it does *not* say that *all* appointed-times are determined by the moon.

A comparison of the Hebrew words for moon and month in Ps 104:19, I Ki 6:38; 8:2, show that a biblical month is a cycle of the moon, but it remains for other Scriptures to refine the meaning of this cycle.

Gen 29:14; Num 11:20-21; Deut 21:13; II Ki 15:13 show that a biblical month is a whole number of days, so that there are no fractions involved.

In a context of rain and clouds that would prevent visibility of the moon for most or some of its cycle over a prolonged period of time, Gen 7:11 with Gen 8:3-4 indicates that a biblical month cannot exceed 30 days.

A comparison of the Hebrew wording in Num 10:10 with I Chr 23:30-31 shows that a *chodesh* (new moon) begins a biblical month. Some examples where *chodesh* means “new moon” are II Ki 4:23; Ezek 46:3; Hos 2:11. Some examples where *chodesh* also means “month” are Gen 29:14; Num 10:11; I Ki 5:14. Each month that comes along in time is a new month, not a renewed month, so it makes the best sense to call the beginning of a month a new moon rather than a renewed moon.

Num 10:1-2, 8, 10 shows that two priests were to blow two silver trumpets to summon the assembly and thereby declare or officially recognize that a new moon, *chodesh*, had begun.

Ancient Babylonian cuneiform inscriptions show that the basis of starting a month in Babylon was official recognition of the sighting of the new crescent in the western sky near the time of sundown, but no month was permitted to have more than 30 days. The day that began with that sundown was the first day of the Babylonian month. A detailed study of the Hebrew

text in Isaiah 47:13 (containing *chodesh*) in its biblical and historical context shows that Israel and Babylon began their month the same way, although their human authority to declare it was different. Isaiah lived before the Babylonian captivity.

Ezra 6:15 mentions the month Adar and Neh 6:15 mentions the month Elul. These are Hebrew transliterations of month names in the Babylonian calendar, but these verses are in the **context of Jerusalem** after the Babylonian captivity. Scripture is a witness here that ancient Israel adopted the month names of the Babylonian calendar at the time of Ezra and Nehemiah because if the first account of these events used only the numbers of the months, there is no reason why this should have been changed later. In order for Israel to have adopted the Babylonian month names in Jerusalem, the months would have nearly always coincided in Babylon and in Israel because otherwise there would have been confusion within the same empire. There would certainly have been times that a difference of one or perhaps even two days in the start of a month might occur due to clouds and rain in Babylon at the beginning of several consecutive months yet clear weather in Israel during those same months.

Neh 8:2, 9 declares that the first day of the seventh month was holy, where the context was in Jerusalem after the return from captivity by Ezra and Nehemiah. The fact that Scripture calls it holy shows that it was being kept at the proper day after the captivity by Israel. Through the adoption of the month names within the same empire, we see that the day to begin the month was conceptually the same for Babylon and Israel at this time in history. The combination of Ezra 6:15; Neh 6:15; 8:2, 9 is the Scriptural evidence with the historical knowledge to supply the context. This evidence is independent of Isa 47:13.

The noun *chodesh* (meaning *month* as well as *new moon*) has the same consonants as the Hebrew adjective *chadash* (almost always translated “new”, and having the meaning “new”) and the Hebrew verb *chadash* (about half the time translated “renew” and half the time “repair”). Hence the collective association of *new*, *renew*, and *repair* is associated with the Hebrew word *chodesh*, rather than the concept of old, dwindling, or thinning, which is associated with the old crescent in the sense of a continuous sequence of snapshots of the visible moon each night as it changes from first visibility to last visibility. Hence linguistically, from the choice of the Hebrew words *chodesh* and *chadash*, it must refer to the new

crescent rather than the old crescent. From these considerations (independent of Isa 47:13 and the separate evidence from Ezra and Nehemiah), the biblical month begins with the day that the Levitical priesthood approves of the sighting of the new crescent with their blowing two silver trumpets. However, no month may have more than 30 days, based on Gen 7:11 with Gen 8:3-4.

Lev 23:2-4 shows that the seventh day, the Sabbath, is an appointed-time that is determined by a cycle of counting from one to seven days, where a numbered day is an alternation of dark and light (Gen 1:4-5; Lev 23:32; Ex 12:18-19). The alternation of dark followed by light is primarily based on the sun (Jer 31:35; Ps 136:7-9; Gen 1:14-18) because the moon does not give any light for counting the alternations for a maximum of three nights each lunar cycle even when the weather is clear, and the stars cannot be seen during a cloudy night. Thus the sun is surely involved among the lights in Gen 1:14.

The word *years* also explicitly occurs in Gen 1:14, which is an astronomical context. This implies that the heavenly lights determine years. Num 28:14; I Chr 27:1 shows that a biblical year consists of a whole number of months, so that no fractions of a month are involved in a year. This shows that the start of the first month begins a year. Thus the need is to determine the first month in order to fully define the biblical year. Although there is a somewhat rough repetitive sequential pattern to the angle of the tips of the horns of the new crescent with respect to the horizon, this pattern has too much variation to be able to distinguish only one new crescent from all the others in order to know the first month. To determine what light or lights could be involved to determine the first month and hence years, we seek to omit those heavenly lights whose single cycle length does not agree with a yearly cycle for the very long term. Thus we omit the moon, the stars, the planets, and the comets. Only the sun remains as a choice to determine the first month. This thought of connecting the sun with the start of the first month will be continued after the next pattern is introduced.

The Hebrew word *tshuvah* is translated as *spring* in many translations and Hebrew lexicons, and spring is determined by the sun. This word *tshuvah* occurs five times in reference to the spring as the *turn* of the year (II Sam 11:1; I Kgs 20:22, 26; I Chr 20:1; II Chr 36:10). Spring begins with the vernal equinox and ends with the summer solstice. The three greatest pyramids of Egypt have one side in an exact east-west direction, and the

only days of the year on which the shadow of the sun falls exactly east-west are on the days of the vernal equinox and the autumnal equinox. Hence ancient Egypt certainly had methods to determine the vernal equinox. Moses was raised by Pharaoh's daughter and was educated in the ways of the Egyptians, so the vernal equinox was a known element to Moses.

Based on Gen 1:14 (with related Scriptures given above), the following are two examples of beginning a new time cycle when a direct light signal from a heavenly body is seen. (1) The beginning of the daily cycle that also begins the Sabbath day occurs with the transition from light to darkness, which is a direct signal from the sun. (2) The monthly cycle begins with the first new light from the moon in the evening (about when the new day begins, provided the new month is officially declared), which is a direct signal from the moon.

This pattern of beginning a new time cycle when a direct light signal from a heavenly body is seen may be extended to the determination of the first month based on the sun. The only consistent visual annual sign of any light from a heavenly body at roughly the time of the year that “the Israelites went out of Egypt” (note Ex 23:15; 34:18 some weeks after Ex 9:31-32), is the vernal equinox. The extension of the pattern implies that the vernal equinox is the visual marker that separates the new moons of one year from the new moons of the next year. In other words, the vernal equinox is a direct signal from the sun, so that the new moon that is seen and officially declared from that time onward is the first new moon of the biblical year. This is corroborated by Ezra 6:15; Neh 6:15 because this shows the adoption of the Babylonian month names during the fifth century BCE by the Israelites in Jerusalem. During that century the first day of the first month of the Babylonian calendar (named Nisanu) began on or after the vernal equinox. Ezra and Nehemiah lived during the fifth century BCE. This is also corroborated by one passage in the writings of Philo of Alexandria.

From II Sam 21:9; Lev 23:10-16; Deut 16:9-10 there is some correlation between the first biblical month and the presence of standing grain of barley in Israel. A detailed study of the Hebrew expressions *chodesh ha aviv* (to designate the first month in Ex 13:4) and *yerach ha etanim* (to designate the seventh month in I Ki 8:2) in the Semitic context does **not** show that the presence of the definite article *ha* in the middle to grammatically force the specific meaning of the word *aviv* or the specific meaning of the word *etanim* to characterize one and only one month. Yes, it is true that only one

month is determined by these expressions because of the unique month number associated with those words, but not because of the Hebrew grammar associated with *ha*.

A detailed study of Lev 2:14 does not restrict *aviv* to be any particular stage or stages of development of the ear of grain. The purpose of Lev 2:14-16 is to explain how to offer firstfruits of grain, not to fully define *aviv*.

Based upon historical reports of the time of the earing and reaping of barley in the various parts of Egypt as well as selected information about wheat in Egypt, the hail plague mentioned in Ex 9:22-34 occurred between January 15 and February 15 (Gregorian dates), which is an earlier time context from Ex 12:2. Due to the difference in temperature between northern Egypt and southern Egypt, the time of the reaping of barley in Egypt is spread out over a five week period. Evidence from Egyptian agricultural timing along with a knowledge of the various stages of development of ears of barley and other grains correlated with Ex 9:31-32 (containing the Hebrew word *aviv*) shows that *aviv* has a wide range of meaning in stages of growth rather than a narrowly defined meaning of one stage. Thus Ex 9:31-32 and Lev 2:14 are consistent in the conclusion that *aviv* does not correspond to only one stage of the development of the ear of barley.

Due to the temperature variation in Israel, the barley is reaped there over a seven week period, assuming the same variety of barley is used. A careful study of the Hebrew in Deut 16:1 does not make it a commandment to go out to look for barley to determine the first month.

A detailed study of the wave sheaf offering from Lev 23:10-16; Deut 16:9-10 shows that the barley that is used in the sheaf for the offering does not have to be at any particular stage in the development of its ears. When the existing Hebrew words in Deut 16:9-10 are examined, it cannot be proved that the Tanak forbids reaping grain before the wave sheaf was offered. On the other hand, Lev 23:14 does forbid eating of the new grain until the wave sheaf is offered. The word *aviv* simply means “ears [of grain]” without specifying its development. Attempting to narrowly define the first month called *chodesh ha aviv* through the meaning of *aviv* applied to barley that is growing in Israel requires unprovable assumptions and contradicts the astronomical context of Gen 1:14-18 utilizing lights. Gen 1:14-18 avoids mentioning heat or plants, which would thereby introduce agriculture.

Ps 133 mentions that the unity of Israelites dwelling together is like oil upon the head of Aaron. Anointing with oil upon the head bestows authority on the priest (Ex 28:41; 29:7-9; 30:30; 40:13-15), and the Aaronic priesthood was given the authority to recognize the sighting of the new crescent by their blowing two silver trumpets on the first day of each month (Num 10:10). They had the authority to teach the law (Lev 10:8, 11; Mal 2:7). Thus the Aaronic priesthood was a source of unity within Israel on all new moons and festivals because there was only one high priest and only one hereditary priesthood. There could be no opposing opinions and disunity concerning the day of the new moon because of the authority of the high priest to achieve unity. This priesthood that was used to achieve unity was only given residence within Israel (Num 35:2-8). II Sam 6:6-7 shows the sudden miraculous death of Uzzah because he took the authority of certain Levites upon himself when he touched the ark. Similarly, only the Aaronic priesthood from the location of Israel has the biblical authority to recognize each new moon. In the absence of the Aaronic priesthood, at least two reliable witnesses from Israel should be used to determine that the new moon has been sighted.

[110] About the Author

I grew up in New York City and was the son of Jewish parents, who sent me to a Hebrew school after public school hours for six years. The highlight of this training was learning elementary biblical Hebrew. In adulthood I earned an M.S. degree in Mathematics from the University of Arizona. My profession is software engineering. This background served me well in later biblical, astronomical, and calendric studies.

This study began in the summer of 1967 while examining some volumes of *Scripta Mathematica*, a journal of Yeshiva University. This journal of mathematics had some articles as well as reviews of books concerning the mathematics and the history of the Jewish calendar. I was amazed that such material would appear in a serious mathematics journal. My interest and curiosity in the subject was kindled at that moment, and I gradually acquired a growing collection of books and articles on the biblical calendar and the Jewish calendar. This igniting moment happened at the library at the University of Arizona in Tucson while I was pursuing graduate work in mathematics. At that moment I never expected that this study would eventually consume thousands of hours of my time and naturally branch out

into long-term studies into Josephus, Philo, the history of astronomy and ancient calendars, the Dead Sea Scrolls, the agriculture and climate of Israel, Rabbinic writings, etc. Major research libraries made this possible, and thus a significant acknowledgement must go to the multitudes of libraries that I visited, often until closing time. On several occasions I visited the library at Hebrew Union College in Cincinnati and later utilized their photocopy services for out-of-town requests. Institutions of higher learning in greater Dallas and Fort Worth, Texas, in Louisville, Kentucky, and in greater Los Angeles were indispensable over the years. I also made several visits to the libraries at the University of Texas at Austin and the University of Chicago.

As the scholarly community began to fill in the gaps in the history of Babylonian and Greek astronomy, I soaked this up and saw how to use some of this material to narrow down the reasonable choices related to the history of ancient Israel and the biblical calendar. The present study represents a major leap forward into some areas that I could not foresee in 1981–1982 when my first studies were written.

[111] Appendix A: Yohanan ben Zakkai and the Sadducees

There are four purposes for devoting space for discussion of Yohanan ben Zakkai in a book on the biblical calendar: (1) Rabbinic accounts relating to his life help to provide some rough picture of the struggle between the priests and the Pharisees after the destruction of the Temple in 70; (2) These Rabbinic accounts provide examples that help us evaluate the historical reliability of Rabbinic literature; (3) These Rabbinic accounts provide a background that helps us determine whether to accept as historically true the Rabbinic stories that relate to the Jewish calendar before the Temple was destroyed; and (4) These Rabbinic accounts provide evidence that teaches us that Rabbinic literature has its roots in Pharisaic beliefs and thinking as opposed to priestly beliefs where they differed from the Pharisees.

According to the *Babylonian Talmud* and other Rabbinic literature, soon after the Temple was destroyed in 70, Yohanan ben Zakkai made several authoritative rulings relating to the Torah that were adopted as law by the general populace of Jews in greater Palestine. The geographical seat of his pronouncements was the city of Yavneh where the new headquarters of Judaism was established. No statement in the Rabbinic literature explicitly refers to him as a Pharisee, but we shall soon quote the *Babylonian Talmud* and thus note that he argued against the Sadducees, so that there can be little

doubt that he was a Pharisee before 70. Rabbinic literature never mentions specific sages or Rabbis as Pharisees, so any such designation becomes interpretive. Perhaps within half a generation after the destruction of the Temple in 70, there was no longer a need for Jewish society to retain the designation of Pharisee because their opposition faded from view. The fact that Yohanan ben Zakkai's pronouncements were accepted as authoritative indicates that he was at the apex of leadership.

The only source of information about Yohanan ben Zakkai is Rabbinic literature. The *Babylonian Talmud*, specifically the section designated Rosh Hashanah 31b (RH 31b), which is on page 152 of BT-BEZ-RH, states. "R. Johanan b. Zaccai lived altogether a hundred and twenty years. For forty years he was in business, forty years he studied, and forty years he taught ..."

Compare these numbers of Yohanan ben Zakkai's life to Moses. Deut 34:7 states, "Moses was 120 years old when he died." Also Ex 7:7 states, "And Moses was 80 years old and Aaron 83 years old when they spoke to Pharaoh." Also Acts 7:23-24 states, "Now when he [Moses] was 40 years old, it came into his heart to visit his brethren, the children of Israel. And seeing one of them suffer wrong, he defended and avenged him who was oppressed, and struck down the Egyptian." Thus Moses spent 40 years in Egypt learning Egyptian knowledge, 40 years in Midian becoming humble, and 40 years in the wilderness teaching the children of Israel. Yohanan ben Zakkai appears as a type of Moses through this division of their lives.

In the Rabbinic work *Sifre to Deuteronomy*, in Pisqa 357: xiv, we note the following in Jacob Neusner's translation:

"1. A. 'Moses was a hundred and twenty years old when he died; his eyes were undimmed and his vigor unabated';

B. He is one of four who died at the age of one hundred and twenty years. These are they:

C. Moses, Hillel the Elder, Rabban Yohanan b. Zakkai, and R. Aqiba.

D. Moses spent forty years in Egypt, forty years in Midian, and forty years as sustainer of Israel.

E. Hillel the Elder emigrated from Babylonia at the age of forty years, served as disciple of sages for forty years, and spent forty years as sustainer of Israel.

F. Rabban Yohanan ben Zakkai spent forty years in trade, served as disciple of sages for forty years, and spent forty years as sustainer of Israel.

G. R. Aqiba studied Torah at the age of forty years, served as disciple of sages for forty years, and spent forty years as sustainer of Israel.”

At first I will assume that the time periods mentioned above are historically correct. The phrase “sustainer of Israel” is applied to the last 40 years of the life of each of these four men, and this is the highest phrase of distinction as the leading sage and teacher, which implies that their role within Judaism was exclusive and supreme as an authoritative teacher during their last 40 years, and there was no overlap in these four 40-year periods. R. Aqiba died in the Bar Kokhba revolt, 132-135 CE. Thus his last 40 years was not beyond 95-135. This implies that Yohanan ben Zakkai’s last 40 years could not have been later than 55-95. In order to have the vigor to be at the apex of leadership after the Temple was destroyed, his leadership qualities would have had to be noticed in Jerusalem at his advanced age of near 80. The *Babylonian Talmud* describes his escape from Jerusalem during the war, so his fame in Jerusalem would have been very significant. However, Josephus never mentions him, although Josephus does put emphasis on Jews in leadership roles.

In the *Babylonian Talmud*, specifically on page 63 of BT-SHAB in Shabbath 15a, we find (where the note in square brackets was added by the translator H. Freedman), “Hillel and Simeon [his son], Gamaliel and Simeon wielded their Patriarchate during one hundred years of the Temple’s existence”. Footnote 6 states that these four were all in a male succession of lineage. This 100-year period would be from 30 BCE to 70 CE. The above quotation has the word “Patriarchate”, which is translated from the Hebrew *nasi*. The title *nasi* is a biblical Hebrew word (Strong’s number 5387) that refers to the primary leader within some context. When the title Patriarch is used as a translation of *nasi* from Rabbinic writings, the document intends to imply that the bearer of this title is the sole spiritual leader (perhaps also quasi-political leader as well, depending on the year and circumstance) of the majority of Jews. The word *nasi* is used in the latter chapters of Ezekiel to refer to a unique future leader of Israel. According to page 493 of the article “NASI” by Christine Hayes, before the destruction of the Temple, Rabbinic literature uses the title *nasi* to refer to “the presiding officer of the Sanhedrin in the Temple”, although in later times it refers to one individual who is recognized as the political head of the Jews scattered among the nations. The definition of *nasi* is not stated in the Rabbinic literature itself, but is surmised from the various contexts. In fact, it is the New Testament and Josephus that cause scholars to reduce the Rabbinic significance of the title

nasi before the destruction of the Temple. From Rabbinic literature itself there is no indication that *nasi* means something different before and after 70. Thus Shab 15a informs us that between 30 BCE and 70 CE the presiding officers of the Sanhedrin in the Temple were among the lineage Hillel, Simeon, Gamaliel, and Simeon. Acts 5:34 calls this Gamaliel a Pharisee.

When would Hillel's last 40 years of life as "sustainer of Israel" be placed if he became head of the Sanhedrin in 30 BCE?

According to BT-PES 3a Hillel was the teacher of Yohanan ben Zakkai, who was his youngest disciple, and from Pisqa 357 above, he became a disciple at age 40. Thus Hillel's students were all at least middle aged. Paul would have been a disciple of Gamaliel c. 20-25. Hillel is not mentioned in either the New Testament or Josephus.

[112] Appendix B: Rabbinic Literature and History

What is called Rabbinic literature was published in the period from c. 200 CE to c. 600. Only some of the documents in this literature will be mentioned here. The first document in this written collection is called the *Mishnah*, and it was published c. 200. The next document is called *The Fathers According to Rabbi Nathan*, and it was published c. 250. Next came the *Tosefta*, which was published c. 225-300. Next came the *Sifre to Deuteronomy* whose date is post-Mishnaic, but otherwise difficult to pin down. Next came the *Jerusalem Talmud* c. 400-450. Next came the *Babylonian Talmud* c. 600. The Talmud is collectively both the *Jerusalem Talmud* and the *Babylonian Talmud*. The *Mishnah* is the first part of the Talmud. The *Mishnah*, the *Tosefta*, and the Talmud contain various statements concerning the Jewish calendar.

(A) Conflict of Interest in the Lineage of the Author of the *Mishnah*

The *Mishnah* is roughly the size of the Bible, and it is primarily a Jewish legal document. It is not written in a manner that is easy to grasp without a commentary. When the *Mishnah* was first released to its scholarly audience (i. e., "published", in the primitive sense) c. 200, its contents reflected the opinions of its primary author, Judah the Nasi. However, this does not deny that much of its contents may have existed in some similar form, whether written or passed down from teacher to student, from even the time of the Pharisees before the destruction of the Temple. Yet there is no evidence of any significant written corpus of material having some title, which was

passed down. The elite among the Jews were trapped within the walls of Jerusalem during the war from 66 to 70 CE, and in the final year famine was severe. The walls gave them protection, but they also blocked out food. Jerusalem and the Temple were burned by the Romans, and according to Josephus, only a small number of writings survived. Only a small number of Jewish scholars survived the destruction of the Second Temple and they did not have reason to imagine that there would be no substitute for the Temple within a reasonable amount of time. The Dead Sea Scrolls have extensive sectarian writings, but these are not collections of laws in the sense that the *Mishnah* is a collection of laws. After Solomon's Temple was destroyed in 586 BCE, it took 70 years to initially complete the Second Temple in 516 BCE (see Ezra 6:15 and commentary notes there from various sources). Beginning in the second century BCE Herod the Great magnificently enhanced the Second Temple. There was no motivation for the immediate scholarly survivors of the destruction of Jerusalem to rush to write down everything they could remember of the details of how the priesthood and the Sanhedrin did everything; this was not done during the Babylonian captivity except for the survival of the Pentateuch and the rest of the Hebrew Scriptures.

The years 132 to 135 saw the second great Jewish war with the Romans known as the Bar Kokhba revolt, and it is not known whether more Romans died in this war or the war from 66 to 70. When Judah the Nasi published the *Mishnah* c. 200, he no doubt knew elderly people who could give him reliable history since the year 135, but the Temple did not function in this period, so that time did not include eyewitness accounts of the proceedings of the priesthood in the Temple. There were probably some reasonably reliable legends from the years between 70 and 135. But it is very doubtful that there were a very large number of written legal details that survived without any change from before 70. We do not know with confidence. Some of the many traditions of the elders implied in Mat 15 and Mark 7 would likely find its way into the *Mishnah*, but this is conjecture.

In the name “Judah the Nasi” as the primary author of the *Mishnah*, the title *nasi* is typically translated Prince or Patriarch. Jewish history suffers from a lack of documents that represents a broad based history as well as a very credible history after 70.

Jewish scholars debate the issue of whether there was any primary Sanhedrin within Judaism after the Temple was destroyed. On page 236 Catherine

Hezser wrote, “While Alon and Mantel believed that the Sanhedrin or central rabbinic council under the leadership of the Patriarch was reconstituted as early as a quarter of a century after the destruction of the Temple, most scholars nowadays dismiss the possibility of a central rabbinic court after 70 and interpret the few rabbinic references to such a court in Tannaitic and Amoraic [Rabbinic] literature as anachronistic reminders of a distant past. Several rabbinic texts explicitly refer to the cessation of the Sanhedrin in 70. Only at the beginning of the fifth century, after the abolition of the patriarchal office, does the *Codex Theodosianus* [in 438] provide external evidence on an institution called ‘sanhedrin’ in Palestine, but this institution is referred to in the plural and might indicate a number of local sanhedrins rather than a central convocation of rabbis.” The chronological separation between Tannaitic literature and Amoraic literature is c. 250. The earlier authors or sages are called Tannaim, and the later ones are called Amoraim. The starting date is somewhat controversial depending on when one thinks that the first writings that are used in the Rabbinic literature were first written. Orthodox Jews might begin c. 30 BCE with Hillel I, while others might begin after the destruction of the Temple in 70 or somewhat later.

The Hebrew word *nasi* in Rabbinic writings is the office of the primary decision maker and leader concerning Jews in the greater Mediterranean region including Europe and Asia. This concept of *nasi* assumes that Judaism as whole is generally mentally united as one body, but without governmental control over any geographical territory. The writings of Josephus, Philo, and the New Testament show that there were separate parties (Pharisees, Sadducees, Essenes) with differing interpretations of the law and different philosophies, so that no one “Patriarch” had the authority of decision on principle matters to which almost all Jews actually agreed. Hence the Rabbinic concept of Patriarch is a fabrication of real history due to its assumption of approximate unity when there was no unity. On page 6 of Strack and Stemberger we note, “The [Rabbinic] sources for a description of the rabbinic period are so biased that the historical picture gained from them remains largely insecure – thus e.g. the notion of a ‘normative’ Judaism derives from these sources.”

There were several Gamaliel's in a genealogical succession beginning with Gamaliel the Elder (Gamaliel I), who taught the apostle Paul, and this line was descended from King David according to the Rabbinic writings

The line of Gamaliel was given a greatly exaggerated role in the Rabbinic writings, especially for the first century, compared to what is justified in historical reality. In Rabbinic writings Gamaliel I, a Pharisee according to Acts 5:34, is given the role of the Patriarch, the head of the Sanhedrin associated with the Temple in Jerusalem. Near the beginning of the Rabbinic writing known as the *Fathers According to Rabbi Nathan*, the primary line of succession of the transmission of the Oral Law went through Gamaliel the Elder, then his son, and this continued in the lineage down to Judah the Nasi. Judah the Nasi had control over the contents of the *Mishnah*, and his motivations were varied concerning what to include and why to include it.

Rabbinic literature calls all of those in the lineage of Judah the Nasi from Hillel onward by the title *nasi* (“Patriarch” of Israel) in their time, although before the Temple was destroyed, modern Jewish scholarship interprets the title *nasi* to mean merely the head of the sanhedrin. Many Jewish scholars have recognized the conflict between the New Testament (with Josephus included) and the Rabbinic writings concerning leadership and have postulated the existence of at least two most prominent national Sanhedrins having different roles before 70, so that the apparent conflict between the New Testament and the Rabbinic writings could be resolved with the latter retaining its credibility.

This question of the hypotheses of multiple national Sanhedrins was handled well by Israeli historian Victor Tcherikover. First he recognizes that Josephus uses the Greek word *boule* meaning “council” (Strong’s number 1210) instead of Sanhedrin. Then he explores several contexts of *boule* in the writings of Josephus, after which, on page 70, he wrote, “We have concluded that the authority of the Jerusalem council was recognized in the whole of Jewish territory, that this institution represented the Jews before the Roman authorities, collected taxes, negotiated with King Agrippa and his Roman governor, and was in charge of the Jerusalem garrison during the procurator’s absence.” The New Testament does not provide as many varied contexts with Sanhedrin. The primary context is the national civil court that is empowered to make official accusations and try cases. In Acts 22:30-23:1 we find [NKJV], “The next day, because he [the Roman commander] wanted to know for certain why he [Paul] was accused by the Jews, he released him from his bonds, and commanded the chief priests and all their council [Sanhedrin] to appear, and brought Paul down and set him before them. Then Paul, looking earnestly at the council [Sanhedrin], said ...” Here we see that the Roman commander recognized the Sanhedrin’s authority to

provide an official accusation against the prisoner. This is part of the function of the Sanhedrin seen in Josephus. On page 71 Tcherikover concludes that "... the council in Josephus and the Sanhedrin in the New Testament were one and the same institution." Tcherikover's goals in this article are to deal with the status of Jerusalem as a city within the Roman Empire, and to determine whether the Rabbinic concept called the Great Beth-Din could be something different from the Sanhedrin in the New Testament. Many Jewish scholars have called the Sanhedrin of the New Testament a political Sanhedrin and the Sanhedrin of Rabbinic literature a religious Sanhedrin. He concludes that Jerusalem did not have the status of a Greek city-state (it was not a Polis). In footnote 17 on page 71 Tcherikover gives two reasons why the Great Beth-Din in Rabbinic literature is the same as the Sanhedrin in the New Testament. The first reason is that "the religious-legal situation in Israel does not allow for any division of authority between institutions with political functions on the one hand and religious functions on the other. The law of the Torah, which is the basic law of the people of Israel, does not distinguish between politics and religion." His second reason is that "those learned in the Torah (Pharisees, scribes) also participated in the Sanhedrin and certainly constituted the majority of the members of the Great Beth-Din." This conclusion by Tcherikover does imply that he recognizes the historical problem in that the Pharisees Gamaliel and his son Simeon were Patriarch's of the Great Beth-Din, yet neither the New Testament nor Josephus represent them with that authority. Tcherikover is not committed to the inerrancy of the Rabbinic literature.

Of course the Orthodox Jewish position is that all Rabbinic writings are inspired and fully true, and by "Orthodox", I refer to its meaning as held by Jewish culture in the United States, not Israel, where "Orthodox" has come to have a different meaning. The male succession in the line of Gamaliel is Gamaliel I, Simon I, Gamaliel II, Simon II, Judah the Nasi, etc. From this lineage is it obvious that Judah the Nasi, the primary author of the *Mishnah*, might have some motivation (conflict of interest) to exaggerate the importance of his own lineage in his account of the snippets of supposed history of Judaism from the first century onward. The first two members of this lineage were both Pharisees; the first is stated to be a Pharisee in Acts 5 and the second is stated to be a Pharisee by Josephus. With the base of this tree of lineage shown to be Pharisaic, it is reasonable to accept the view that the *Mishnah* represents a near-Pharasaic approach to the law.

(B) Can the Talmudic Concept of the Oral Law be Historically True?

Mat 15:3, 6; Mark 7:8-9, 13 does show that from the perspective of the writers of the New Testament, the tradition of the Pharisees invalidates the original intent of the law of Moses. Josh 8:32-35 shows that all the law that was given to Moses was written down, so that the concept that there was an Oral Law that was spoken to Moses but never written down until the time of the *Mishnah*, but was instead accurately handed down only by Oral transmission from the time of Moses is a historically false concept, assuming that the reader accepts the Tanak and the New Testament as reliable. The concept of the truth of the Oral Law is promoted in the Rabbinic writings, and it is an example of false history in the Rabbinic writings. This is one reason for mistrusting history in the Rabbinic writings.

(C) Summary of some Reasons for Lack of Reliability in the Historical accuracy of the *Mishnah*

The *Mishnah* and its closely related Rabbinic writings cannot generally be trusted for historical accuracy concerning the early first century and earlier for at least the following reasons:

(1) According to Rabbinic literature, the primary leader, the Patriarch of Israel or President of the Sanhedrin, is supposedly in the lineage of Judah the Nasi, but this fabrication of history is contradicted by the New Testament. Josephus, who discusses politics during his lifetime, does not know of the occupation of the sole leadership of the Sanhedrin by this line. Josephus does mention Simon, the son of Gamaliel the Elder, and mentions him as a respected and prominent Pharisee, but does not go beyond that.

(2) One should expect doctrinal bias by Judah the Nasi concerning remnants of the “tradition of the elders” that survived from the first century, and some of these traditions are likely to have only been accepted by a segment of society from the first century because there were sects with differing beliefs according to the New Testament, the Dead Sea Scrolls, and Josephus.

(3) While the Rabbinic writings mention some doctrinal conflicts between the priests and the Pharisees (or some other leaders who are not identified by any party label), they have no sustained discussion of different sects during the first century. The Rabbinic writings show no interest in providing its readers with any general history of Jewish politics or sects, and assumes that there always was only one mainstream Judaism that agrees with the Oral Law. These writings are set in a dream world of its own culture.

(4) Neither Philo, nor Josephus, nor the New Testament mentions the concept of an unchanged Oral Law since Moses. This does not mean the same thing as “tradition of the elders”, which only goes back for a limited time. Mat 15 and Mark 7 show this to be a false concept. It is not feasible that a body of law as large as the *Mishnah* was memorized unchanged without any mention of it by these sources.

(5) There is great doubt that written records of a vast law could have survived the destruction of the Temple by fire. It is difficult to imagine that no changes in thinking would occur in 130 years, so that this vast body of law would remain intact. Josephus never mentions any written law outside the law of Moses. He does mention the names of the biblical books familiar to us, and does not mention other books. Of course the Oral Law directly implies that it is not written, so that we should not expect it to be found written down from the Talmudic viewpoint, but instead we should at least expect it to be mentioned as a clear concept with its origin to Moses. This is contrary to the phrase “tradition of the elders” because “tradition” has a nebulous origin.

(6) Some of the legal statements in the *Mishnah* and the rest of the Talmud, such as the day upon which to begin the count to Pentecost, seem to be politically motivated against the priesthood, which vanished from history soon after the Temple was destroyed in 70. This anti-priesthood bias in some of the laws and discussions shows legal statements based upon the defeat of the priesthood, which had not yet been defeated before 70. This bias is a distortion of history in the sense that it portrays its present position as the original position from the days of Moses. With such a bias in this context, how could anyone trust it in other areas that very briefly allude to some event of history?

(7) The Talmudic story of the escape from Jerusalem by Yochanan ben Zakkai, the first leader of the Jews at Yavneh after 70, claims that during the severe famine in Jerusalem near the end of the war, Yochanan was carried to the Roman General Vespasian in a coffin. However, according to Josephus, at the end of the first two years, before the famine had set in, Vespasian became emperor and went to Rome leaving his son Titus in command. This is a glaring historical factual error. Further details are available on pages 264-270 of Jonathan Price.

(8) There are hundreds of legal rulings in the *Mishnah* and Talmud that are stated as having been given by certain named sages, yet in different places there are different named sages who are given credit for the same laws. These voluminous apparent contradictions are called false attributions. In the past, scholars had written biographical sketches of individual sages based

upon what they are claimed to have said. But today this method of writing Talmudic biography is recognized by Conservative Jewish scholars as virtually worthless for true biography. This makes the concept of history for named sages very problematic.

(D) Talmudic Decisions on the Calendar by the Gamaliel's and Simon

When the Talmud mentions that a Gamaliel or a Simon made an official proclamation that he was adding an extra month to the calendar for a combination of reasons, I do not at all believe in the historical validity of such a claim, nor do I believe that the combination of reasons stated were in fact operative before the Temple was destroyed. Philo of Alexandria only mentions the vernal equinox. The *Mishnah* claims that a select committee within the Sanhedrin made such a decision, so this contradicts Talmudic claims that a Gamaliel or a Simon made the decision. The *Mishnah* is the first part of the Talmud; thus the Talmud is self-contradictory. Based upon the authority that I see vested in the chief priests in the Temple area according to the New Testament, it seems to me that the chief priests made such calendric decisions rather than a select committee that was heavily represented by non-priests.

In order for the Talmudic portrayal of the Pharisees from before the destruction of the Temple to demonstrate the alleged authority of the Pharisees, the Talmud uses the illustration of the control of the calendar by specific primary leaders of the Pharisees. The Talmud asserts the authority of Gamaliel the Elder, his son Simon, and his grandson Gamaliel II by employing a calendric method that requires the judgment of an authority figure. No explicit statement exists that Gamaliel II was a Pharisee, but there is little reason to doubt it unless the need for the party vanished. As if merely using the ripeness of barley were not complicated enough (what variety, where to look, how to define ripeness, et cetera), they even included other criteria that required a judgment based upon a combination of factors (even ripeness of fruit trees along with considering the date of the equinox). No precisely defined formula is given by the *Mishnah*, so that an authority figure becomes a requirement.

(E) Modern Conservative Jewish Views concerning Rabbinic Literature

Jacob Neusner is an internationally recognized authority on the Talmud and a Conservative Jewish scholar. On page 13 of Neusner 1994, we find the

following concerning the Rabbinic literature, “Sayings and stories were made up and attributed to prior times or authorities.” On page 68 Neusner wrote, “Ample evidence in virtually every document of rabbinic literature sustains the proposition that it was quite common for sages to make up sayings and stories and attribute the sayings to, or tell stories about, other prior authorities. Considerations of historical fact did not impede the search for religious truth: the norms of belief and behavior. That is why, if all we want are historical facts, we cannot believe everything we read except as evidence of what was in the mind of the person who wrote up the passage: opinion held at the time of the closure of a document.”

David Kraemer, a Conservative professor at the Jewish Theological Seminary of America in New York wrote the following two paragraphs at the start of his chapter on page 201:

“Scholars, mostly Jewish but also non-Jewish, have been using Rabbinic sources for historical study for well over a century. These studies - one ‘History of the Jews in the Talmudic Period’ or another - have been, almost without exception, what Jacob Neusner terms ‘gullible.’ They have assumed, in other words, that the Rabbinic record can, more or less, be taken at its word and that, once one has determined the ‘original version’ of a teaching and discounted obvious fabulous material, one may accept that teaching as historically reliable.

“By this stage in the development of Judaic scholarship, the folly of these earlier habits is broadly recognized. Neusner and others have pointed to a variety of crucial and even fatal flaws in the approach just described, and there is hardly a scholar writing today about the history of Jews in late antiquity who does not at least pay lip service (though often no more than lip service!) to the much repeated critique. But even the critical questions that have been articulated - Can we believe Rabbinic attributions for purposes of dating a tradition? Why should we believe what any given tradition reports? and so forth - do not capture the full scope of the problem of using such records for writing history. In the following pages, I will describe the obstacles that would have to be overcome before we could be sure that a Rabbinic record contains historically reliable evidence. I will conclude that these obstacles are effectively insurmountable, and that most sorts of political, social, or religious histories cannot be constructed on the basis of Rabbinic testimony.”

Note that at the end of the above quotation Kraemer states that Jewish political history cannot be constructed from Rabbinic writings which especially includes the Talmud, the first part of which is the *Mishnah*, dated about 200 CE.

In footnote 38 on page 98 of Grabbe 1997 we find, “[Talmudic tractate] Rosh ha-Shanah normally assumes that the sages [generally non-priests] sat to receive witnesses [of having seen the new moon]. However, [*Mishnah*] M. Rosh ha-Shanah 1.7 mentions that the witnesses reported to the priests; this datum which goes against the views of the rest of the tractate is likely to have been a genuine memory of pre-70 times when the priests - not the rabbis - declared the sacred calendar.”

On pages 35-36 of Green we read, “Before the fall of the Jerusalem temple in A.D. 70, the priests proclaimed the sacred times of the year. In the aftermath of the temple's destruction, the new rabbinic movement appropriated that priestly task to itself.”

On page 81 of Neusner 1984 we have, “The Pharisees before 70 did not control the Temple and did not make laws to govern its cult [the Levitical priesthood]. But afterward, they made plans for the conduct of the Temple when it would be restored.”

On page 39 of Cohen 1986 we see, “Our methodological dilemma is heightened when we confront a contradiction between rabbinic and nonrabbinic sources. The most prominent example of this sort of difficulty is the nature and composition of the sanhedrin. Rabbinic texts, both legal and anecdotal, regard the sanhedrin as a supreme court *cum* senate, populated by rabbis and chaired by two rabbinic [non-priestly] figures. Josephus refers to a *koinon* and *boule* as well as a *synedrion*. From Josephus we do not know whether these are all one and the same institution and whether these are permanent or ad hoc bodies, but we see that aristocrats and high priests as well as Pharisees figure prominently in the discussion of these matters. The testimony of the NT matches that of Josephus (except that the NT does not use *koinon* and *boule* to refer to a supreme council in Jerusalem). How do we resolve this contradiction? Should we conclude that the composition and leadership of the Jewish supreme council changed over the centuries and that the rabbinic and Greek sources reflect different stages in this development? Or should we conclude that Josephus and the NT present a basically accurate

picture which the rabbis have ‘corrected’ and improved either through wishful thinking or intentional distortion?”

[113] Appendix C: Nisanu 1 in the Babylonian Calendar Compared to the Vernal Equinox during the Century of Ezra and Nehemiah

The use of Babylonian month names in Ezra 6:15 and Neh 6:15 in the context of Jerusalem makes it relevant to examine the actual dates of the vernal equinox compared to Nisanu 1 of the Babylonian calendar during the 100 years from 499 to 400 BCE, which is the century of Ezra and Nehemiah. The month name Nisanu was transliterated to Nisan by the Jews in the context of Jerusalem. The first chart shown in this appendix makes it clear that the vernal equinox separated the first month Nisanu from the last month of the old year. The adoption of the Babylonian month names in Scripture shows the acceptance of the rule of the vernal equinox in the calendar of Jerusalem.

Before the year 499 BCE the Babylonian calendar year’s first month named Nisanu did not follow any regular pattern with respect to the vernal equinox. From that date onward a 19-year cycle was accepted for Nisanu by the Babylonians. By this I mean that there were 235 lunar months in each successive 19 years, and among these 235 months, the month numbers that were called Nisanu were numerically repeated. Each 19 years in the cycle had 12 years that contained 12 months and 7 years that contained 13 months. The sequence of the years among the 19 that had 13 months was repeated in each successive 19 years. In the years that had 13 months, the extra month is called the intercalary month. This cycle was begun by the Babylonians.

The first day of Nisan in the Babylonian calendar since 499 BCE fell on or after the vernal equinox. Although Parker and Dubberstein show an exception to this in the year 384 (page 34), this alleged exception should be corrected because it is now regarded to be a faulty examination of a cuneiform text; see pp. 14 and 16 in Aaboe and others 1991

This appendix features a chart consisting of the 100 years from 499 to 400 BCE. For each year the date and time of the vernal equinox is stated and the date of the first day of the first month, Nisanu 1, is stated. Both dates are according to the Julian calendar. For each Julian date given, the Babylonian day began on the evening that came before the Julian date (the latter is based upon a midnight-to-midnight day). Determination of the vernal equinox for

these 100 years was made using the computer program BRESIM (see the bibliography). This program is noted for its accuracy into ancient times for the vernal equinox, but not for the position of the moon.

The book by Richard Parker and Waldo Dubberstein 1956 contains data that has its origin in the writings on the cuneiform inscriptions on ancient clay tablets from Babylon, most of which are in the British museum. The two keys to the whole enterprise are: (1) The eclipse records on the clay tablets; and (2) The number of years of the reign each of the of the kings who ruled over the Mesopotamian region. The lengths of reign of these kings are in the writings of Claudius Ptolemy (c. 150). The results of this book are based upon modern astronomy and calculations that go backwards in time to verify the accuracy in time of the data on the clay tablets. The Julian calendar dates that equate to Nisanu 1 during these 100 years are taken from pages 29 –33 of this book.

The book by Richard Parker and Waldo Dubberstein provides Julian calendar dates for the ancient Babylonian calendar. Eclipse records from ancient Babylon were used to determine those years that had 13 months rather than 12 months. The underlying data that was used by Parker and Dubberstein was examined by Fatoohi and others in a paper from 1999. The conclusion on page 52 is that only 209 out of about 8670 new moons in this book are provably based upon actual sighting by the Babylonians. All the other new moons in this book are calculated based upon the methods of Karl Schoch (see page 57 of Fatoohi and others). None of the 100 months that began Nisanu in the chart below are among these 209 actual sightings of the new crescent from Babylon. One day errors in Parker and Dubberstein may be due to: (1) Any borderline case in Schoch's curve at the end of the 29th day where the true result is different (this might be true about 7 percent of the time); (2) Poor weather that caused an otherwise visible crescent at the end of the 29th day to not be seen; and (3) A mistake in calculation noting that this book was prepared before the general availability of computers.

The chart does verify that the vernal equinox is indeed the borderline that determines the beginning of Nisanu, the first month in the Babylonian calendar. But additional care must be exercised in the small number of cases where Nisanu 1 occurs on the vernal equinox or one day away from it. The critical cases are examined separately in another chart afterward. For this second purpose the time of the astronomical new moon that is published in Goldstine is first used. This source takes into consideration the value of delta

T, which is the cumulative effect of the change of the length of the day, which is the result of the slowing of the earth's rate of rotation on its axis due to tides, the wind against the land, the drag of the earth's semi-liquid core against its outer mantle, etc. According to page 60 of Fatoohi and others, the estimate of delta T is 4.66 hours in 501 BCE. Most computer programs do not have great accuracy that far back in time.

Then the number of hours from the astronomical new moon to sunset is computed, and this is used to check the reasonableness of the date in Parker and Dubberstein.

A friend of mine, Rob Anderson, wrote a computer program based upon the Hewlett-Packard 3000 minicomputer and its unique operating system in 1980-1982. This program was modeled after Schoch's curve, and all the months of the 20th century near the equinoxes were used in order to determine the minimum required time from the astronomical new moon to sunset in order to be able to see the new crescent, but only the latitude of Jerusalem was used. This program determined that during the vernal equinox the minimum required time varied from 16 to 24 hours, and during the autumnal equinox the minimum required time varied from 18 to 48 hours. This is corroborated by page 46 of Wiesenberg. This range of hours depends on the angle between the ecliptic (the angle of the path of the sun) and the western horizon. This means that for Nisanu 1 the benchmark for comparison is the time interval between 16 and 24 hours. For the critical years in our situation, it happens that this rule alone is sufficient to determine the first day of visibility of the new crescent, provided the weather was clear.

The journey of Ezra to Jerusalem mentioned in Ezra 7:7-9 is stated there to have occurred in the seventh year of Artaxerxes. According to page 32 of Parker and Dubberstein this was in the year 458 BCE, accepting that Ezra entered Jerusalem before Nehemiah. The books by Horn and Wood, by Bo Reicke, and by Kenneth Hoglund, accept or favor Ezra as settling in Jerusalem before Nehemiah, and this is the traditional understanding. Eventually Ezra and Nehemiah are in Jerusalem together (Neh 8:9; 12:26). While opinions may be found that favor the opposite (Nehemiah preceding Ezra), such opinions doubt the veracity of the stated accounts in Ezra and Nehemiah. Discussion of this may be found on pages 89-93 of Horn and Wood, pages 14-19 of Reicke, pages 40-44 of Hoglund, and pages 98-106 of Grabbe 1991. Since Ezra 7:7 mentions the seventh year of King Artaxerxes

and Neh 2:1 mentions the 20th year of King Artaxerxes, it appears that Nehemiah journeyed to Jerusalem about 13 years after Ezra. I accept Ezra's entry in 458 BCE and Nehemiah's entry about 445 BCE, but only with the understanding that if the method of numbering the year of reign was shifted by half a year in Judah compared to Babylon, then these years might instead be 457 BCE and 444 BCE. The commentaries differ on this and I do not have a firm opinion.

In the table below the time is based on Greenwich, England as given in the program BRESIM. Conversion to the time zone of Babylon could be accomplished by adding three hours. The critical years for the vernal equinox compared to the new moon in this table are 484, 465, 446, 427, and 408. These years are used for further analysis in the second table below.

There are three times in the 100 years when the day prior to the vernal equinox was a new moon day. All three times this new moon day began an intercalary month (a month added beyond the 12 normal months) called the second Adar, the 13th month. These dates are March 25, 454 BCE, March 25, 435 BCE, and March 25, 416 BCE.

Vernal Equinoxes compared to Nisanu 1 in Babylonian Calendar

Date BCE	Time V.E.	Nisanu 1	Date BCE	Time V.E.	Nisanu 1
3-27-499	00:29	4-11	3-26-449	03:07	3-29
3-27-498	06:22	3-31	3-26-448	08:50	4-16
3-26-497	12:10	4-18	3-26-447	14:36	4-06
3-26-496	18:04	4-08	3-26-446	20:30	3-26
3-26-495	23:43	3-28	3-26-445	02:26	4-13
3-27-494	05:36	4-16	3-26-444	08:14	4-03
3-26-493	11:35	4-04	3-26-443	14:02	4-22
3-26-492	17:13	4-23	3-26-442	20:00	4-11
3-26-491	23:06	4-12	3-26-441	01:50	3-31
3-27-490	04:56	4-02	3-26-440	07:37	4-18
3-26-489	10:40	4-19	3-26-439	13:27	4-07
3-26-488	16:30	4-09	3-26-438	19:17	3-28
3-26-487	22:08	3-30	3-26-437	01:06	4-14
3-27-486	03:57	4-18	3-26-436	06:48	4-04
3-26-485	09:52	4-06	3-26-435	12:33	4-23
3-26-484	15:27	3-26	3-26-434	18:28	4-13

3-26-483	21:17	4-14	3-26-433	00:20	4-01
3-27-482	03:15	4-03	3-26-432	06:04	4-20
3-26-481	09:05	4-21	3-26-431	11:50	4-09
3-26-480	15:03	4-11	3-26-430	17:39	3-29
3-26-479	20:50	3-31	3-25-429	23:26	4-16
3-27-478	02:40	4-19	3-26-428	05:09	4-05
3-26-477	08:38	4-08	3-26-427	10:56	3-26
3-26-476	14:16	3-28	3-26-426	16:50	4-14
3-26-475	20:04	4-15	3-25-425	22:42	4-03
3-27-474	01:59	4-05	3-26-424	04:27	4-22
3-26-473	07:42	4-22	3-26-423	10:18	4-11
3-26-472	13:30	4-12	3-26-422	16:18	3-31
3-26-471	19:13	4-01	3-25-421	22:10	4-18
3-27-470	01:01	4-21	3-26-420	03:59	4-07
3-26-469	06:59	4-09	3-26-419	09:47	3-27
3-26-468	12:40	3-29	3-26-418	15:37	4-15
3-26-467	18:27	4-17	3-25-417	21:28	4-04
3-27-466	00:22	4-06	3-26-416	03:09	4-23
3-26-465	06:07	3:25	3-26-415	08:53	4-13
3-26-464	11:56	4-13	3-26-414	14:44	4-02
3-26-463	17:43	4-03	3-25-413	20:25	4-19
3-26-462	23:32	4-22	3-26-412	02:07	4-08
3-26-461	05:28	4-11	3-26-411	07:55	3-29
3-26-460	11:09	3-31	3-26-410	13:50	4-17
3-26-459	16:58	4-19	3-25-409	19:46	4-05
3-26-458	22:57	4-08	3-26-408	01:34	3-26
3-26-457	04:49	3-27	3-26-407	07:22	4-14
3-26-456	10:40	4-15	3-26-406	13:20	4-03
3-26-455	16:29	4-04	3-25-405	19:07	4-21
3-26-454	22:16	4-23	3-26-404	00:52	4-10
3-26-453	04:06	4-12	3-26-403	06:45	3-30
3-26-452	09:46	4-02	3-26-402	12:34	4-18
3-26-451	15:29	4-20	3-25-401	18:25	4-07
3-26-450	21:22	4-10	3-26-400	00:10	3-27

The table below has the five critical years from the above table that the new moon occurs in close proximity to the vernal equinox. The column headed “Astronomical New Moon” has data that comes from the reference Goldstine (its computation is based on the time zone from Babylon), but three hours were subtracted to convert from the time zone of Nineveh to Greenwich time. The column headed “Sunset” has data that comes from the computer program “LoadStar Professional”; this has an adjustment for delta T and it verifies the dates for Nisanu 1 according to Schoch’s curve for the years below as given in Parker and Dubberstein. The ancient city of Nineveh was used as the location in Babylon. It is located where Mosul, Iraq is today, and its coordinates are longitude 43 degrees east, latitude 36 degrees 9 minutes north.

Vernal Equinox BCE	Astro-nomical New Moon	Sunset Nineveh (Greenwich time)	Hours from conjunction to sunset	Expected New Moon (from hours)	Parker & Dub. Prior New Moon	Number of days in the prior month
3-26-484 15:27	3-24-484 02:02	3-24 15:18	13:16	3-26	2-24	30
3-26-465 06:07	3-23-465 14:55	3-24 15:18	24:23	3-25	2-25 leap yr	29
3-26-446 20:30	3-24-446 11:35	3-25 15:19	24:44	3-26	2-25	29
3-26-427 10:56	3-24-427 12:09	3-25 15:19	27:10	3-26	2-25	29
3-26-408 01:34	3-24-408 11:07	3-25 15:19	28:12	3-26	2-25	29

In the above table the expected new moon always agrees with the computed date from Schoch’s curve as given in Parker and Dubberstein. In all cases except 465 BCE the expected new moon is the date of the vernal equinox. In 465 BCE it is possible that bad weather did not allow the new crescent to be seen, so that the old month had 30 days instead of 29 days, and the actual Nisanu 1 was March 26 instead of March 25. Three hours would have to be added to attain the time zone of Nineveh. In all of these cases the following rule would work out correctly. Find the date of the noontime which is closest to the time of the vernal equinox. That date is counted as the date of the vernal equinox.

[114] Appendix D: Karl Schoch's Table for Visibility of the New Crescent

This chart is taken from page 162 of Fotheringham. It was created using apparent geocentric coordinate positions. I usually use LoadStar software.

The azimuth of the sun at the time of sunset is taken. Then the azimuth of the moon at the time of sunset is taken. The smaller of these two numbers is subtracted from the larger, and the result is called the azimuth difference. For a given azimuth difference, if the altitude (= angular height) of the moon at sunset is greater than the table value, the moon is likely to be visible in that evening. Plus or minus half a degree in altitude is considered borderline.

Azimuth difference in degrees, at sunset	Altitude of the moon in degrees, at sunset	Azimuth difference in degrees, at sunset	Altitude of the moon in degrees, at sunset
0	10.4	11	9.1
1	10.4	12	8.9
2	10.3	13	8.6
3	10.2	14	8.3
4	10.1	15	8.0
5	10.0	16	7.7
6	9.8	17	7.4
7	9.7	18	7.0
8	9.5	19	6.6
9	9.4	20	6.2
10	9.3	21	5.7

Borderline example 1: Cisco, Texas. Latitude: 32 degrees 30 minutes north. Longitude: 99 degrees 0 minutes west. Date: Friday, March 31, 1995. A group of people were together in Cisco, and all were looking for the new crescent. About half of them were able to see it and point to it, but the others with them could not see it. The humidity was about 35 percent, and the skies were clear. Sunset converted to Greenwich time was 0:55 April 1, 1995. The azimuth of the sun at sunset was 275 degrees 36' 39" (= 275.61 degrees). The azimuth of the moon at sunset was 275 degrees 1' 47" (= 275.03 degrees). Hence the azimuth difference is 0.58 degrees. The altitude of the moon at sunset was 10 degrees 10' 0" (= 10.17 degrees). According to Schoch's curve, for an azimuth difference of 0.58 degrees the moon's

altitude needs to be 10.4 degrees, but it was only 10.17 degrees, which is 0.23 degrees below Schoch's curve. This borderline case for sighting was achieved at 0.23 degrees under Schoch's curve.

Borderline example 2: Location is 20 miles northwest of Eilat, Israel. Latitude: 29 degrees 48 minutes north. Longitude: 34 degrees 53 minutes 24 seconds east. Date: Thursday, September 28, 2000. A group of 10 people were together with tripods and binoculars in the dry desert on top of a small hill, and all were looking for the new crescent. Only three of the 10 were able to see the crescent with the naked eye although they all knew exactly where to look. The humidity was low, perhaps 20 percent, and the skies were clear. Sunset converted to Greenwich time was 15:29. The azimuth of the sun at sunset was 267 degrees 45' 45" (= 267.7625 degrees). The azimuth of the moon at sunset was 262 degrees 17' 56" (= 262.2989 degrees). Hence the azimuth difference is 5.4636 degrees. The altitude of the moon at sunset was 9 degrees 36' 44" (= 9.612 degrees). According to Schoch's curve, for an azimuth difference of 5.4636 degrees the moon's altitude needs to be 9.907 degrees, but it was only 9.612 degrees, which is 0.295 degrees below Schoch's curve. This borderline case for sighting was achieved at 0.295 degrees under Schoch's curve.

Conclusion: It would seem to be very difficult to see the new crescent with the naked eye from the latitudes of Israel below 4000 feet above sea level when the altitude of the moon is below 0.3 degrees under Schoch's curve. The likelihood of seeing the new crescent with the naked eye clearly recognizable for a while below 0.5 degrees under Schoch's curve seems almost impossible.

[115] Appendix E: Time from Sunrise to Sunset to compare with the Vernal Equinox

This table has the number of hours of daylight for four cities that represent four latitudes in the United States. The time of daylight is the time from sunrise to sunset. Only the dates near the two equinoxes are shown.

	New Orleans 30 deg N	Memphis 35 deg N	Philadelphia 40 deg N	Minneapolis 45 deg N
Mar.15	11:57	11:57	11:55	11:53
Mar.16	12:00	11:58	11:57	11:55
Mar.17	12:02	12:00	12:00	11:58
Mar.18	12:03	12:03	12:03	12:03
Mar.19	12:05	12:05	12:05	12:05
Mar.20	12:07	12:08	12:08	12:08
Mar.21	12:09	12:10	12:11	12:12
Sep.22	12:09	12:09	12:11	12:11
Sep.23	12:07	12:07	12:08	12:08
Sep.24	12:06	12:06	12:05	12:06
Sep.25	12:03	12:03	12:03	12:03
Sep.26	12:01	12:01	12:00	11:59
Sep.27	12:00	11:58	11:57	11:56
Sep.28	11:58	11:57	11:55	11:53
Sep.29	11:57	11:54	11:52	11:50

The above data is calculated from tables in SUNRISE. This data is based upon values for 1966, which may vary by one or two minutes in certain years. The vernal equinox occurred on March 21, 1966 at 01:53 Greenwich time. The autumnal equinox occurred on September 23, 1966 at 11:43. This shows the influence of refraction near the eastern and western horizons at varying latitudes. Equal day and night do not occur on the same dates for all latitudes. Equal day and night occur a few days before the vernal equinox and a few days after the autumnal equinox.

[116] Appendix F: Comparing the Sighting of the New Crescent with MCJC

This appendix compares the theoretical sighting of the new crescent from Jerusalem with the first day of the first and seventh months in the modern calculated Jewish calendar (= MCJC) using the software written by Rob Anderson (see the Preface). This study is based upon 200 months in the years 1901 to 2000 inclusive. In order for a month to be included in the table, it had to be declared the first month (Nisan) or the seventh month (Tishri) according to the MCJC.

In the table below each year has six columns to its right, the first three relate to the first day of the first month based upon the MCJC, and the last three relate to the first day of the seventh month based upon the MCJC. All of the dates are based upon the daylight part of the day, although the biblical day begins the previous numbered day at sundown. The date of a conjunction is the sundown-to-sundown day upon which the astronomical new moon occurred, but the date of the daylight part of the day is used. To make the comparison with the MCJC simpler, the columns with the conjunction show the number of days of adjustment to the MCJC that must be made to obtain the conjunction. The columns that are labeled “New crescent” are based upon the daylight part of the day for which the new crescent was theoretically visible the previous evening based upon Karl Schoch’s curve as computed by Rob Anderson’s computer program. The number in that column shows the number of days to add to the MCJC column at its left in order to obtain the date of the new crescent.

The conjunction agrees with the MCJC 26 times out of 200, which is 13 percent. The new crescent agrees with the MCJC 45 times out of 200, which is 22.5 percent.

Year	Conjunction	MCJC	New crescent	Conjunction	MCJC	New crescent
1901	-1	Mar.21	1	-2	Sep.14	1
1902	0	Apr.8	2	-1	Oct.2	2
1903	0	Mar.29	2	-1	Sep.22	1
1904	0	Mar.17	2	-1	Sep.10	2
1905	-2	Apr.6	1	-2	Sep.30	1
1906	-3	Mar.27	0	-2	Sep.20	0

1907	-2	Mar.16	0	-2	Sep.9	1
1908	-1	Apr.2	1	-1	Sep.26	1
1909	-2	Mar.23	0	-2	Sep.16	0
1910	-1	Apr.10	1	-1	Oct.4	1
1911	0	Mar.30	2	-1	Sep.23	2
1912	-1	Mar.19	2	-1	Sep.12	1
1913	-2	Apr.8	0	-2	Oct.2	0
1914	-2	Mar.28	1	-2	Sep.21	1
1915	-1	Mar.16	2	0	Sep.9	3
1916	-2	Apr.4	0	-1	Sep.28	2
1917	-1	Mar.24	1	-1	Sep.17	2
1918	-2	Mar.14	0	-2	Sep.7	1
1919	-1	Apr.1	1	-1	Sep.25	2
1920	0	Mar.20	2	-1	Sep.13	2
1921	-1	Apr.9	1	-2	Oct.3	0
1922	-2	Mar.30	0	-2	Sep.23	0
1923	-1	Mar.18	1	-1	Sep.11	2
1924	-1	Apr.5	1	-1	Sep.29	2
1925	-2	Mar.26	0	-1	Sep.19	1
1926	-2	Mar.16	0	-2	Sep.9	0
1927	-1	Apr.3	1	-2	Sep.27	1
1928	-1	Mar.22	1	-1	Sep.15	1
1929	-2	Apr.11	0	-3	Oct.5	0
1930	0	Mar.30	2	-1	Sep.23	1
1931	0	Mar.19	2	0	Sep.12	2
1932	-1	Apr.7	1	-1	Oct.1	1
1933	-2	Mar.28	0	-2	Sep.21	1
1934	-2	Mar.17	0	-1	Sep.10	1
1935	-1	Apr.4	1	-1	Sep.28	2
1936	-1	Mar.24	1	-2	Sep.17	1
1937	-1	Mar.13	1	-2	Sep.6	1
1938	-2	Apr.2	0	-3	Sep.26	0
1939	0	Mar.21	2	-1	Sep.14	2
1940	-2	Apr.9	1	-2	Oct.3	0
1941	-2	Mar.29	1	-1	Sep.22	1
1942	-3	Mar.19	0	-2	Sep.12	1
1943	-2	Apr.6	1	-1	Sep.30	1
1944	-1	Mar.25	1	-1	Sep.18	1
1945	-1	Mar.15	1	-2	Sep.8	0

1946	0	Apr.2	2	-1	Sep.26	1
1947	0	Mar.22	2	-1	Sep.15	1
1948	-1	Apr.10	1	-2	Oct.4	1
1949	-2	Mar.31	0	-2	Sep.24	0
1950	-1	Mar.19	1	0	Sep.12	2
1951	-1	Apr.7	1	0	Oct.1	2
1952	-2	Mar.27	0	-1	Sep.20	2
1953	-2	Mar.17	0	-2	Sep.10	1
1954	-1	Apr.4	1	-1	Sep.28	2
1955	0	Mar.24	2	-1	Sep.17	2
1956	-1	Mar.13	1	-2	Sep.6	1
1957	-2	Apr.2	0	-3	Sep.26	0
1958	-2	Mar.22	0	-2	Sep.15	1
1959	-1	Apr.9	1	-1	Oct.3	1
1960	-2	Mar.29	0	-2	Sep.22	1
1961	-2	Mar.18	0	-1	Sep.11	1
1962	-1	Apr.5	1	-1	Sep.29	2
1963	-1	Mar.26	1	-2	Sep.19	1
1964	0	Mar.14	2	-1	Sep.7	1
1965	-1	Apr.3	1	-2	Sep.27	0
1966	0	Mar.22	2	-1	Sep.15	1
1967	-2	Apr.11	1	-2	Oct.5	1
1968	-2	Mar.30	1	-1	Sep.23	2
1969	-2	Mar.20	0	-2	Sep.13	1
1970	-1	Apr.7	1	-1	Oct.1	2
1971	-1	Mar.27	1	-1	Sep.20	2
1972	-1	Mar.16	1	-2	Sep.9	1
1973	0	Apr.3	2	-1	Sep.27	2
1974	-1	Mar.24	2	-1	Sep.17	1
1975	-1	Mar.13	2	-1	Sep.6	2
1976	-2	Apr.1	0	-2	Sep.25	1
1977	-1	Mar.20	2	0	Sep.13	2
1978	-1	Apr.8	1	0	Oct.2	2
1979	-1	Mar.29	1	-1	Sep.22	1
1980	-2	Mar.18	0	-2	Sep.11	0
1981	-1	Apr.5	1	-1	Sep.29	1
1982	0	Mar.25	2	-1	Sep.18	1
1983	-1	Mar.15	1	-1	Sep.8	1
1984	-2	Apr.3	0	-2	Sep.27	0

1985	-2	Mar.23	0	-2	Sep.16	1
1986	-1	Apr.10	1	-1	Oct.4	2
1987	-2	Mar.31	0	-1	Sep.24	1
1988	-1	Mar.19	1	-1	Sep.12	2
1989	0	Apr.6	2	-1	Sep.30	3
1990	-1	Mar.27	1	-1	Sep.20	2
1991	0	Mar.16	2	-1	Sep.9	2
1992	-1	Apr.4	1	-2	Sep.28	1
1993	0	Mar.23	2	0	Sep.16	2
1994	-1	Mar.13	1	-1	Sep.6	2
1995	-1	Apr.1	1	-1	Sep.25	2
1996	-2	Mar.21	0	-2	Sep.14	1
1997	-1	Apr.8	1	-1	Oct.2	2
1998	0	Mar.28	2	-1	Sep.21	2
1999	-1	Mar.18	1	-2	Sep.11	1
2000	-2	Apr.6	0	-3	Sep.30	0

On the evening that ends September 28, 2000 the new crescent was seen by three people in a group of 10 that specifically went to a good sighting location about 20 miles northwest of Eilat, Israel (see appendix D). This made September 29 the day of the new crescent, so that for the year 2000, the actual number was -1 instead of 0 as seen in the above chart.

[117] Appendix G: Smith's Paper

This is a complete copy of W. Robertson Smith's reference (see the bibliography) except for a section written in Arabic for which Smith includes a translation that he puts in quotation marks shown in the published paper and which is copied below.

NOTE ON EXODUS IX. 31, 32

1. All over Egypt it is common to raise at least two crops of barley - *shitawi* and *seifi*. See Lane, *Modern Egyptians*, ch. xiv., from which it will be seen that the *seifi* or summer crop is sown about the vernal equinox or later, and so has no bearing on the text before us. Dr Grant-Bey of Cairo, who has kindly made a series of enquiries for me among natives and Europeans who know the country parts of Egypt, says however that in the Sharkiya district there are sometimes three crops of barley, and about

Mansura and in the Gharbiya even four. What follows refers to the winter crop (*shitawi*).

2. The data of the harvest varies greatly in different parts of Egypt. From the Rev. Mr Harvey of the American mission Dr Grant got the following dates, applicable to the country south of Cairo:

(a) The barley is in ear from the latter part of February to 15th March.

(b) The flax is in flower from January 10th and in seed from February 15th.

(c) When the barley is in ear the ears of wheat begin to form, but the grains are in a milky state.

The difference between upper and lower Egypt is about 35 days.

3. Rev. Dr Lansing of Cairo visited the region of Zoan in the first part of May, 1880, and found the farmers reaping barley while the wheat was nearly ripe. But he was told that the crops were at least a fortnight later than usual.

4. I have before me an Arabic letter to Dr Grant-Bey from a farmer in the district of Kalyub, a little north of Cairo. The following is a transcript of part of it.

[Arabic text appears here]

“The barley is in ear in the beginning of January, and the flax blooms in the middle of January, and the seed is found in it in the beginning of April. When the barley is in ear the wheat is green herbage; but the seasons vary as I told you.”

As the date when the flax blooms is almost the same in this statement as in Mr Harvey's it is plain that Mr Harvey is thinking of an earlier stage of the seed capsule, when he speaks of February 15th, than the native writer has in view when he says that the *bizr* or seed-grains are found in the beginning of April. On the other hand it is pretty plain that Mr Harvey's statement about the barley refers to the full ear, when harvest is about to begin. The letter of the native farmer gives what we want, for he speaks of the state of the barley when its ear is formed, but not that of the wheat. And at that time the flax is in flower, which appears to determine the sense of *gevol*.

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