

The biblical minimum and maximum age of the earth

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Careful consultation with the biblical record reveals a series of timespans linking creation to the Crucifixion. As a thought experiment, we combined these timespans to estimate the minimum and maximum allowable date of creation. Our goal was not to contradict the existing body of literature on the subject, but to put constraints on what is and is not biblically allowable. Implied precision and potential cultural differences (e.g. calendar systems, birthday conventions, and rounding conventions) mean we cannot pinpoint the age of the earth to a single year, yet the accumulated imprecision from those sources is limited to a maximum range of 308 years. Even including textual variants and debates over interpretation does not allow for dates approaching 10,000, let alone billions of years of Earth history. Accounting for all presently known relevant details and assuming the Babylonian Captivity began in 587 or 586 BC, we can say with confidence that the Bible places limits on the year of creation between 5665 and 3822 BC. The uncertainty within this range is mainly driven by textual considerations. The Masoretic/LXX debate creates a 1,326-year dichotomy, the Long vs. Short Sojourn positions differ by 215 years, and various interpretations of the lists of the kings of Judah and Israel equates to around 54 years of additional uncertainty. Christians should avoid dogmatic claims of dating precision greater than intended by the Bible that could be refuted with new evidence, causing some to mistakenly believe the Bible itself has been refuted. Yet the combined tally of all the available data gives us fairly tight constraints on the age of the earth.

Using the Bible to estimate the date of creation has a long and rich history. The early Church Fathers put numbers on it, as did scientific greats like Sir Isaac Newton (about 4000 BC) and Johannes Kepler (3992 BC). The great academic and Archbishop James Ussher's date of 'Oct 23, 4004 BC' is perhaps the most famous estimated date in history, although he has been much maligned by scoffers in recent years.

Most scholars veered away from biblical fidelity in the 19th and 20th centuries and very few seemed interested in mining the Bible for chronological details. In more recent years, however, the pages of this journal have been filled with many contributions on the subject.

Starting with the first issue in 1984, Osgood [1] began publishing a series of papers that stretched out over the next several issues, eliciting responses and counter-responses from various people. Over the years, more than a dozen different authors have published papers on chronology in this journal. They disagree on some of the details and there have been several sharp disputes, but two

things unite them: a belief in the perspicuity of Scripture and a desire to systematically derive a consistent biblical dating scheme.

We set out not to put a specific date on creation, but to put limits on the range of acceptable dates. And, while we certainly have strong opinions on how to resolve several of the historic debates, we wanted to know the ‘worst case’ scenario rather than to assume those opinions are correct.

We acknowledge the great amount of work that has already been done and we are indebted to the prior body of publication. However, there are several factors that have not yet been systematically outlined and these have a small but important effect on all date calculations. This paper was foreshadowed by one of the earlier contributors, Pete Williams, whose paper “Some remarks preliminary to a biblical chronology” appeared in these pages in 1998.[2]

Numerical locks

There are some specific dates given in the Bible that are not up for debate. When a biblical author says a person was X years old when something happened, if we do not take that as a historical statement we quickly get to the point where words have no meaning. Many such numbers can be found throughout the Bible. For instance, we know that Caleb was 40 years old when he was sent with the other spies to Canaan (Joshua 14:7), and we know that he was 85 when he approached Joshua after the invasion of Canaan was completed to request Hebron for his inheritance (Joshua 14:10). We also know that the spying was done in the fall because it occurred during the grape (and pomegranate) harvest (Numbers 13:20, 23). Statements like these are a very important source of data for biblical chronology.

There are other statements which give us a span of time between events. For example, in the time of the Judges, the Ammonites attempted to lay claim to the Reubenite territory just south of Ammon and east of the Dead Sea. Jephthah taunted the Ammonite king, saying, “While Israel lived in Heshbon and its villages, and in Aroer and its villages, and in all the cities that are on the banks of the Arnon, 300 years, why did you not deliver them within that time?” (Judges 11:26, ESV). Thus, it is clear that the Israelites had occupied that area for 300 years. This probably does not mean ‘exactly’ 300, but it proscribes any attempt to reduce the period of the Judges to much smaller values.

There are other numbers in the Bible, however, that are more ambiguous, and when we string together multiple dates and date ranges, each with a certain degree of built-in ambiguity, we must acknowledge certain limits to precision.

Factors which limit dating precision

To generate a potential range of dates for creation, there are several sources of imprecision for which we must account. Some of these sources are inherent in the way humans report numbers. Others come from ambiguous statements in the biblical text (such as Terah’s age at Abram’s birth, see below). Still others come from the fact that we do not know which time-keeping conventions the ancients may have used.

Williams used the phrase ‘cumulative imprecision’ to describe the problem.[2] We will copy his terminology, but by ‘imprecision’ we do not mean ‘error’ or that the biblical authors were sloppy with their reporting. On the other hand, we should not read biblical time statements as though the intent of the authors was to build a minute-by-minute timeline of Earth history. Most of the time statements are simple reports of major happenings, and they tied those to a general series of datable events (like a man’s age at the birth of a son). Sometimes, but not always, a series of dates can be bridged by a spanning statement that reduces the cumulative imprecision. And considering that most dates are given in ‘years’, we should not consider these to be an exact day count. This is what we mean by ‘imprecision’.

Accounting for each source of imprecision widens the potential range of dates for creation, and there are many factors to consider, yet each source of imprecision has a limited effect. Therefore,

the extent of the accumulated imprecision is also limited. We will consider each source of imprecision in turn.

Implied precision

When humans report measurements, the context or style of the report often implies the precision of that measurement. If someone were to claim a structure was 100 m long, but it turned out to be 101 m long, it would be false to claim the person said it was *exactly* 100 m long. One cannot arbitrarily change significant figures when reporting numbers. Another source of ambiguity deals with rounding of numbers, and we should not assume ancient writers used modern rounding conventions, e.g. anything $\geq .5$ gets rounded up to the next integer. For all we know, they may have always rounded down.

An example can be found in 1 Kings 7:23 concerning the Bronze Sea that Solomon commissioned to be made for the Temple: “it was round, ten cubits from brim to brim, and five cubits high, and a line of thirty cubits measured its circumference” (ESV). Modern scoffers often claim the Bible wrongly teaches the value of π (the circumference of a circle divided by its diameter) to be ‘3.0’ rather than the correct ‘3.14 ...’. They are claiming a greater precision than was specified. Ignoring whether the Bronze Sea was a perfect circle, and whether the diameter measurement was for inside or outside, it could be anywhere from 9.5 to 9.7 cubits in diameter (e.g. ‘10’) to give it a circumference of between 29.8 and 30.5 cubits (e.g. ‘30’) using the correct value of π . When our interpretation includes a correct understanding of implied precision, we find that the value of π derived from operational science agrees with the record of 1 Kings 7:23.

Calendar systems

In addition to the uncertainties generated by implied precision, one must also consider the time-keeping convention used by the people reporting those dates. Many ancient societies used lunisolar calendar systems, where months are tied to the lunar cycle, but an occasional 13th intercalary month is added to keep months aligned with seasons, since 12 lunar months are 11 days short of a solar year. Some societies also standardized the process with the addition of 7 deliberately placed intercalary months within 19-year cycles. This was more predictable than the ‘as needed’ method but still required an additional intercalary month every 80 years to keep months aligned with the seasons. However, standardization would often take centuries and different localities have often used conflicting systems. While we do not know the exact antediluvian method used, we do know that the Jews have used a lunisolar calendar since the Exodus, when Moses was directed by God to institute a new system (Exodus 23:16, Leviticus 23:39, etc.).

There are abundant examples of cultures changing time conventions. Before Islam, the Arabs used a lunisolar system, but Muhammad arbitrarily abolished the use of intercalary months in the Qur’an (9:36–37).

Modern Muslim countries such as Saudi Arabia use a 12-lunar-month Hijri calendar, where a month in summer one year will be in winter 17 years later. Their year numbering starts with Mohammed’s move from Mecca to Medina in 622 AD. On the New Year’s day 2014 AD (1,392 solar years later), the Hijri year was 1435.

There are many other examples of societies wrestling with time measurement. For instance, the Romans arbitrarily changed the date of the New Year to January 1 in the second century BC. The ‘years of confusion’ which followed were resolved by the Julian calendar, which re-aligned the months to the seasons by having one year with 445 days. Many ancient cultures began their year at the vernal equinox, while others began at the autumnal equinox. Various European localities up to the Middle Ages used a diversity of days to begin the year after the Council of Tours outlawed New Year’s celebrations in 567. Even the Gregorian calendar system, with January 1 as New Year’s Day, was not adopted uniformly across Europe, with the British Empire holding out until 1752, and some jurisdictions even longer than that.

Ancient peoples living in temperate latitudes presumably measured tropical years instead of sidereal years.[3] However, ancient peoples living near the equator (or in places with no pronounced seasonal differences, e.g. the way many people imagine the antediluvian world) might be expected to

default to a sidereal year, when the sun/stars/Earth return to the same alignment. Since a sidereal year is only about 20 minutes longer (1 sidereal year = 1.00003878 tropical years), this would have no significant impact on any age calculations, to the nearest year, adding at most one hour every three years, or just under 14 days in 1,000 years. However, this would have affected Ussher's 'Oct 23, 4004 BC' date, so the reader is cautioned.

The Mayans used multiple simultaneous calendars, including a 260-day divine calendar (the most important), a long-count calendar similar to the Julian Calendar (with which they dated past and future events), a civil calendar similar to the Gregorian calendar, and a 584-day calendar based on the position of Venus (where five Venusian years are about eight solar years, or 99 lunar months).

The point of this brief survey is to illustrate the fact that we do not know which convention was used in the ancient past, and we do not know if all biblical data are reported with the same convention.

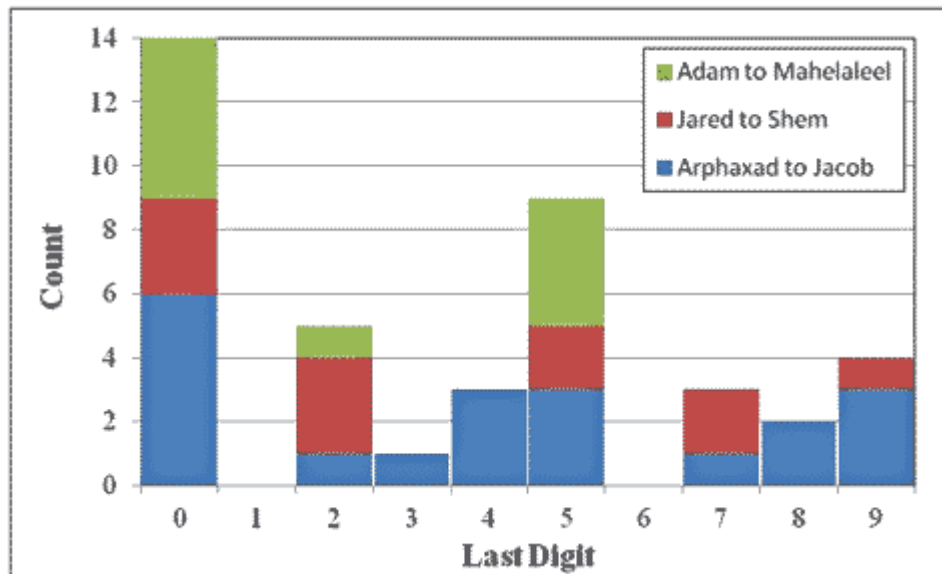


Figure 1. Histogram of last digits of Patriarch age data reported in Genesis. Not included are any ages back-calculated from the text (e.g. age of Noah, Terah, and Jacob when Shem, Abram, and Joseph were born). Note that the only '9' comes from Methuselah's age of death, which may have been back-calculated in the original, for the year of his death was quite obvious and significant. This is clearly not a random distribution, but the final digits appear more random as time progresses. After the Flood, most digits appear and the distribution appears more or less random, with the exception of more zeros than expected.

Years may have been reported in systems other than ones that align with solar years, and multiple possible shifts of six months or more may have occurred when societies switched or reformed their calendar systems.

Cultural differences in birthday conventions and counting age

So far we have considered imprecision in number reporting and a diversity of changing calendar systems, but we must also consider how ages are reported. In some East Asian cultures, newborns are traditionally said to be 1 year old (better translated 'in his first year') and ages are advanced at the lunar New Year, instead of on the birthday. It is possible that a child in these cultures could be '2 years old', while native English speakers would say '1 month'. In addition, some cultures count age from conception rather than birth.

People sometimes keep track of multiple time conventions simultaneously and can flip from one to the other at will, meaning it is often difficult for an outsider to keep up, and context is of utmost importance. Therefore, we must allow for two fewer years than the reported biblical 'ages' in order to account for unknown birthday conventions.

Rounding imprecision accumulates

There are detailed genealogical lists in the Bible (e.g. Matthew 1, Luke 3). Some, however, come with specific dates and ages (e.g. Genesis 5, Genesis 11). The latter are more properly called ‘chronogenealogies’[4] and they are of utmost importance, for they allow us to build a straightforward history of the time period they cover. Yet, there are certain facts about these numbers for which we must account. The chronogenealogies of Genesis are not based on a calendar system. The years are given as the age of the father, not the age of the earth (*anno mundi* or AM). If, as in modern English-speaking cultures, they used zero-based ages incrementing on birthdates, since a child can be born anywhere within that one-year span, each generation should add an average of six months to the calculations. It is unlikely that a series of children would all be born on each successive father’s birthday or on the day before those birthdays.[2] But, accounting for the possibility of both extremes allows us to better estimate the range of dates for creation. Assuming random birthdates and that the ages were zero-based, 10 generations would carry about 5 extra years. But if ages were one-based (babies are in their ‘1st year’; Genesis 7:6 and 11 hint this was their convention), we should subtract about 5 years for every 10 generations instead. Many scholars of the past, including Ussher,[5] have failed to recognize what we call ‘date slippage’.

Table 1. Minimum (Min), maximum (Max), and simple additive (Add) dates for Adam to Noah from Genesis 5, accounting for potential differences in birthday and rounding convention. Additive dates were generated by simply adding up the given numbers in the text. Minimum dates take into account potential rounding and the possibility of a 1-based birthday convention. Maximum dates take into account the possibility of a ratcheting scheme with a 0-based birthday convention. See text for an explanation of the adjustment values at each generation.

Person	Birth year (<i>anno mundi</i>)			Age at birth of son		
	Min	Add	Max	Min	Add	Max
Adam	0	0	0	126	130	135
Seth	126	130	135	101	105	110
Enosh	227	235	245	86	90	95
Cainan	313	325	340	66	70	75
Mahalalel	379	395	415	61	65	70
Jared	440	460	485	160	162	165
Enoch	600	622	650	63	65	67
Methusaleh	663	687	717	185	187	190
Lamech	848	874	907	180	182	185
Noah	1028	1056	1092			

To test the effects of date slippage over the number of reported generations between Adam and Noah, we created a simple Excel spreadsheet and populated it with pseudo-random numbers representing the month of birth of consecutive children over 10 generations. After 1,000 trials, fully 92% of the replicates (nearly 2 standard deviations) had a total slippage of 4–6 years and only 1.5% had a slippage of as few as 2 or as many as 8 years. This works for both positive (0-based) and negative (1-based) date slippage. Clearly, this is a factor that needs to be taken into account when attempting to date creation, but it primarily applies to the pre-Exodus chronogenealogies.

Rounding of ages?

Consider the first five biblical Patriarchs listed in Genesis 5. Their ages at the birth of the next in line and at death are listed, but nine of the ten ages end in a 0 or a 5 (figure 1). This suggests the numbers may have been rounded to the nearest five. Or they may have used a 5-year ratcheting scale, where the age was only incremented every five years, meaning Adam could have been nearly 135 and still truthfully report his age as ‘130’. The lone ‘2’ is Seth’s age at death. From Jared to

Shem, we see two additional digits, giving the appearance that they rounded down and to the nearest ‘2’. The lone ‘9’ is Methuselah’s age at death. Interestingly, in both cases the distribution of the reported numbers is evenly balanced (i.e. about the same number of zeros and fives from Adam to Mahalaleel and about the same number of zeros, twos, fives, and sevens from Jared to Shem).[6]

We are not trying to prove these dates are rounded or ratcheted, but since the numbers are so odd (i.e. not what one would expect from a random sampling, as even the post-Flood patriarchs have three times more zeros than expected), we must allow for the possibility. In order to account for potential changes in rounding conventions, we will allow for a 5-year rounding convention from Adam to Mahalaleel, a 2–3-year rounding convention from Jared to Shem (table 1), and 1-year rounding (i.e. the modern convention) after that (table 2).

Why might the author of this section of Genesis have rounded these ages to the nearest five years? Possibly this was due to their great age, where a count precise to a single year might not be all that important to the individual when reporting his age, although ratcheting is more likely in this case. Searching for a mathematical reason for the apparent rounding leads us to consider the possibility that the first few generations measured ages in 60-month periods.

Initially, the lunar cycle would have been the most obvious way to track time, especially if Eden and/or its environs did not have significant seasonal variance.

They may have measured longer periods of time in groups of lunar months instead of years. If the first five patriarchs reported ages in 60-month blocks, the ages may have been converted later by multiplying by five, giving us the ages we have in the biblical record (with one exception) in 12-lunar-month years. There are many possible reasons for the appearance of these numbers, including random chance, but we are obliged to consider both rounding and ratcheting in our calculations because we cannot rule out these possibilities.

Table 2. Minimum (Min), maximum (Max), and simple additive (Add) dates for Arphaxad to Jacob from Genesis 11, 21, and 25, accounting for similar potential differences in birthday and rounding convention as in table 1.

Person	Birth year (<i>anno mundi</i>)			Age at birth of son		
	Min	Add	Max	Min	Add	Max
Arphaxad	1628	1659	1697	33	35	36
Salah	1661	1694	1733	28	30	31
Eber	1689	1724	1764	32	34	35
Peleg	1721	1758	1799	28	30	31
Reu	1749	1788	1830	30	32	33
Serug	1779	1820	1863	28	30	31
Nahor	1807	1850	1894	27	29	30
Terah	1834	1879	1924	128	130	180
Abraham	1962	2009	2109	98	100	101
Isaac	2060	2109	2210	58	60	61
Jacob	2118	2169	2271			

Calculating the timespan and range

The above imprecision factors come in two categories: ‘per-link’ and ‘overall’. The following calculations will accumulate per-link factors (such as from birthday conventions & rounding), then apply the overall factors (such as calendar conventions) at the end.

Creation to Noah

Table 1 lists the minimum, maximum, and simple additive dates for Adam to Noah from Genesis 5, accounting for potential differences in birthday and rounding convention.

Noah to Arphaxad

Genesis 7:6 and 7:11 state the Flood started in Noah's 600th year, and 8:13 states the Flood ended in his 601st year. This eliminates the possibility of ± 5 rounding. Applying the limits of potential birthday conventions and offsets, we find the Flood started between 598 and 601 years after Noah's birth. The simple additive date for the Flood is AM 1656, but it could have been anywhere from AM 1626 to AM 1693. Genesis 11:10 tells us Arphaxad was born two years after the Flood. This could mean 'in the second year after the Flood started' (just over one year after the Flood ended), 'during the second summer/winter/fall/spring after the Flood ended', or up to not quite 3 years after the Flood ended.[2] Simply adding up the spans shows Arphaxad was born around AM 1659, with an outside range of 1628 to 1697. Note that we skipped Shem on purpose, because the best links are from Noah to the Flood to Arphaxad, making the ambiguity of Shem's birth year irrelevant.

Arphaxad to Terah

Table 2 lists the minimum, maximum, and simple additive dates for Arphaxad to Jacob from Genesis 11, 21, and 25.

A 50-year ambiguity from Terah to Abram

The age of Terah when his son Abram was born is ambiguous because we only know Terah was 70 when Abram's oldest brother was born. The narrative from Genesis 11:26–12:5 states that Terah, Abram and family moved from Ur to Haran, lived there a while, and Abram moved on from there to Canaan. That narrative implies (and Acts 7:4 confirms) Abram waited until his father died before leaving for Canaan, and states he was 75 when he left. If Abram left very soon after Terah died at 205, this would have made Terah 130 when Abram was born. But the text does not exclude the possibility that Abram waited.[2] He may have lived in Haran for decades after his father Terah died before leaving for Canaan. All we know is he was old enough to be married to a wife 10 years younger (Genesis 17:17) before (Genesis 11:31) they moved to Haran. Terah therefore may have been as old as 180 when Abram was born, assuming Sarai was at least 15 when she married Abram. This is a break from the strict chronogenealogy and impacts the date of creation by up to 50 years.

Abraham to the Exodus

Genesis 21:5, 25:26 and 47:28 and Exodus 12:40–41 allow us to estimate the number of years from Abram's birth to the Exodus. Assuming a plain reading of Exodus 12, this amounts to 720 years, 430 of which occur between Jacob's move to Egypt and the Exodus. The 400 years of Genesis 15:14 would start in Exodus 1:8 when the Pharaoh who knew Joseph was replaced by one who enslaved the Israelites. Note that although Genesis 21:5 says Abraham was 100 when Isaac was born, this does not allow for ± 5 rounding because in Genesis 17:1 we were told he was 99 the year before Isaac was born. Jacob and 11 of his sons moved to Egypt in AM 2299. Simply adding the spans puts the Exodus in AM 2729 with a range of 2676 to 2834.

However, Ussher [5] and others [7,8,9,10,11] have proposed that the 430 years Israel lived in Egypt started with God's promise to Abraham in Genesis 12:1–3 instead of with Jacob's arrival in Egypt. The 400 years of Genesis 15:14 would then start in Genesis 21:8–9, when Ishmael mocked Isaac at his weaning feast.

Rather than attempt to resolve this historic debate here, we acknowledge both positions have strengths and weaknesses, and include the range from both positions for the range of the Exodus: AM 2461 to AM 2834. From this point on, we will use the timespan for the Long-Sojourn view, acknowledging that the Short-Sojourn additive, minimum and maximum dates will be 215 years less.

Table 3. Differences between the Masoretic (Mas.), LXX, and Samaritan Pentateuch relevant to the date of Creation.

		Age at birth of son				
	MT	LXX		SP		
Person	Age	Age	Effect	Age	Effect	Reference
Adam	130	230	100	130	0	5:3-5
Seth	105	205	100	105	0	5:6-8
Enosh	90	190	100	90	0	5:9-11
Cainan	70	170	100	70	0	5:12-14
Mahalalel	65	165	100	65	0	5:15-17
Jared	162	162	0	62	-100	5:18-20
Enoch	65	165	100	65	0	5:21-24
Methusaleh	187	167	-20	67	-120	5:21-27
Lamech	182	188	6	53	-129	5:28-31
Noah	500	500	0	500	0	5:32, 9:28-29
Shem	100	100	0	100	0	11:10-11
Pre-Flood subtotals			586		-349	

Arphaxad	35	135	100	135	100	11:10-13
Cainan		130	130			11:13 (LXX only)
Salah	30	130	100	130	100	11:12-15
Eber	34	134	100	134	100	11:14-17
Peleg	30	130	100	130	100	11:16-19
Reu	32	132	100	132	100	11:18-21
Serug	30	130	100	130	100	11:20-23
Nahor*	29	79	50	79	50	11:22-25
Post-Flood subtotals			780		650	

Exodus-Solomon	480	440	-40	0	0	1 Kings 6:1
Grand totals			1326		301	

* Some English versions mistakenly translate Nahor's age at Terah's birth as 179 years old, but the Greek manuscripts read 79.

The Exodus through the Babylonian captivity

The books of Kings and Chronicles contain an unbroken chain of timespans from the Exodus to the Babylonian captivity. Simply adding up the years with the maximum length within the implied precision from each link yields a maximum biblically compatible timespan of 437 years from the beginning of Solomon's reign to the Babylonian Captivity.

Thiele¹² claimed regnal years were reported by two different systems: 'accession year' (1-based) and 'non-accession year' (0-based) reckoning. He presented evidence of swaps between conventions in both Judah and Israel, in addition to the two kingdoms using differing conventions simultaneously, which limits the precision of dating simply based on cross-referencing regnal years.

Further complicating the matter, Judah appears to have advanced regnal years in the spring (Nisan), when their new year began, while Israel advanced theirs in the fall (Tishri), when their new year began. Thiele's 383 years from the start of Solomon's reign to the Babylonian Captivity is probably the shortest timespan proposed by a conservative scholar. Additional modifications and discussions of Thiele's work can be found in Kaiser [13] and Kitchen.[14] Jones [15] accounts for changing regnal year conventions and differing new year months using a more straightforward interpretation than Thiele to arrive at a longer timespan of 429 years. Pierce [16] rejects Thiele completely, and Clarke rejects Austin's, and Ashton and Down's,[17] attempts at linking biblical chronology to Egyptian chronology because they base their ideas on Velikovsky, whom he claims has been thoroughly discredited.[18] All of these authors have a high view of Scripture. Clearly, biblical chronology is a difficult subject.

Table 4. Final Earth age range estimates (all dates BC).

Text	Sojourn	Lunar Min*	Min	Add	Max
MT	Short	3822	3909	4005	4124
	Long	4031	4121	4220	4339
SP	Short	4114	4207	4306	5590
	Long	4323	4422	4521	5805
LXX	Short	5108	5232	5331	5450
	Long	5316	5447	5546	5665

* Minimum with 12-lunar-month years prior to the Exodus.

The Babylonian captivity to Christ

2 Kings 23–24 states that the Kingdom of Judah was carried into captivity in three waves, and the extra-biblical historical consensus is that these waves occurred in 597 BC, 587–586 BC, and 582 BC.

The only biblical timespan between then and the New Testament comes from Daniel 9:24–26. This prophecy places a minimum of 7 + 62 'sevens', commonly assumed to mean 483 years from 'the decree to rebuild Jerusalem' until the Crucifixion of Jesus Christ. Yet, there are multiple such decrees, and we are not sure to which Daniel refers, although Austin argues strongly for one specifically, while at the same time removing a gap of 80–82 years, inserted by Ussher and others, by equating Darius to Artaxerxes.[19]

We must also rely on extra-biblical history to pinpoint the birth of Jesus Christ. This seems to be fairly well established at around 4 BC, although there are various biblically conservative counter-arguments for a variety of dates in that range. The year of Christ's death can be garnered from secular sources, and is attested by Daniel 9. Yet, we chose to peg our age estimate to the start of the Babylonian captivity because it allows for a slightly higher degree of certainty and because there is little dispute after that date.

Masoretic vs. LXX vs. Samaritan Pentateuch

A few hundred years before Christ, Alexandrian Jews produced a Greek translation of the Old Testament called the Septuagint (commonly abbreviated LXX). The authors of the New Testament frequently quoted directly from the LXX when referencing the Old Testament. The Masoretic text is the collection of Hebrew Scriptures collated around 700–1000 AD and is the basis of most modern Old Testament translations. We have many ancient fragments of Scripture in Hebrew (e.g. the Dead Sea Scrolls), which match the Masoretic very closely, showing the quality of work of the copiers in the intervening years, and supporting the authenticity of the Masoretic.

The LXX puts the earth significantly older than the Masoretic: including 586 additional years before the Flood and 780 additional years from the Flood to Abraham's grandfather, Nahor (table 3).

This is mostly due to the LXX including 100 more years in the ages of various Patriarchs at the birth of their son. The LXX also includes a Patriarch named Cainan between Arphaxad and Salah in Genesis 11:13.

This name does not appear at that point in the Masoretic or Samaritan Pentateuch. Most Greek texts of Luke 3:36 agree with the LXX on that point. From Terah forward, the primary date-relevant conflict is 1 Kings 6:1, in which the LXX dates the beginning of Solomon's temple to 440 years after the Exodus vs. 480 in the Masoretic. Even though we favour the Masoretic, we cannot know *for certain*, and therefore must acknowledge the possibility of the older dates from the LXX by adding 1,326 years to the maximum age allowed by the Masoretic.

There is another source of differing chronological data, the Samaritan Pentateuch. Written in Hebrew, but with a different etiology, it differs from the Masoretic in several thousand places, sometimes agreeing with the LXX and sometimes not.[4] We do not put much stock in its authority, but see table 3 for details. It subtracts 349 years before the Flood and adds 650 years after it, for a net of 301 years more than the Masoretic.

Discussion and conclusions

Limited, gap-free imprecision

As detailed above, there are no chronological gaps from Genesis 1:1 to the Babylonian Exile. There is also no place where the text allows the insertion of an unlimited amount of time. In addition, this paper also takes the Genesis 1 narrative literally, leaving no room for a time gap there. Many have attempted to argue for gaps in the Genesis chronogenealogies, but, for example, even if Enoch were Jared's great-grandson rather than his son, that would not change the timespan; Jared was still 162 when Enoch was born and this would not change the date of creation. Thus, there is no reason to argue for these gaps.

Ambiguities and imprecisions do not equate to falsehoods

The ambiguities detailed here do not mean the text is untruthful or erroneous. That a modern Western person would use a different number convention to describe age than someone of a different culture or time does *not* mean that either party is mistaken or lying. It merely means that a proper time convention translation is necessary. In the absence of complete information, the number should be understood to imply a range of possible ages. Our interpretation needs to allow for various possible implications of the original text, resulting in a range of possible ages. A range more narrow than intended by the Bible could conflict with valid outside evidence, and influence people to (incorrectly) disbelieve the Bible. But the Bible does make historical claims that can be used to estimate the age of the earth, so we should not pretend the earth could be any age. These claims can and should be used by Christians to evaluate the accuracy of extra-biblical historical claims.

Resulting date ranges

From creation to the Babylonian Captivity, we calculated a per-link imprecision of 219 years (including the 50-year ambiguity concerning how long Abram remained in Haran), plus an overall systemic imprecision of 89 years. It is not possible to date creation with any more accuracy using just the genealogical data. We should allow for the possibility of ± 10 years of imprecision from calendar system changes, and the possibility of up to 3% less solar years before the Exodus if the ancients used 12-lunar-month years or longer blocks of lunar months which would later be converted to 12-lunar-month years. We must also consider the possibility of 1326 additional years if the LXX chronogenealogies represent the original wording, 301 additional years if the Samaritan Pentateuch is correct, 215 less years for the 'Short Sojourn' view, and 46 fewer or 8 more years due to the ambiguities in the king lists of Judah and Israel. This yields an outside range of 3236 to 5078 years from Creation to the Babylonian Captivity. If the traditional historic date of 587 BC or 586 BC for the Captivity is correct, the earth cannot be more than 7,680 years old (table 4), having been created between 5665 BC and 3822 BC. The date of the Flood is more significant to the evaluation of extra-biblical history than is the date of creation. The Flood probably occurred between 2600 BC and 2300 BC, but certainly between 3386 BC and 2256 BC (table 5).

Table 5. Date estimates for the Flood (all dates BC).

Text	Sojourn	Lunar Min*	Min	Add	Max
MT	Short	2256	2280	2349	2431
	Long	2464	2495	2564	2646
SP	Short	2886	2930	2999	3081
	Long	3095	3145	3214	3296
LXX	Short	2972	3020	3089	3171
	Long	3181	3235	3304	3386

* Minimum with 12-lunar-month years prior to the Exodus.

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