

The Biblical Chronologist

WHAT HAS BEEN IS REMOTE AND EXCEEDINGLY MYSTERIOUS. WHO CAN DISCOVER IT?

(Ecclesiastes 7:24)

Volume 3, Number 1

January/February 1997

Chronology of Noah's Flood

In the previous issue of The Biblical Chronologist I focused on sedimentary data from Elk Lake which seem to testify to the presence of Noah's Flood in North America at approximately 3520 B.C. This discovery adds to the already substantial mound of evidence that a millennium was accidentally dropped from the text of 1 Kings 6:1 in antiquity.¹ It also launches the field of Biblical chronology into a search for additional evidences of Noah's Flood in other natural reservoirs of chronologically controlled, geophysical data. Potentially suitable reservoirs for searching include, for example, polar ice sheets, tree-rings, and additional lake sediments from around the world.

As this search begins it is important to have in mind the most accurate picture possible of what Noah's Flood was like. For this search one would like to know, for example, whether it is reasonable to expect the Flood to have been recorded by the bristlecone pine trees which have grown for millennia in the White Mountains of California. What would the Flood be expected to look like in the tree-ring chronology which has been derived from these trees? The answer to this question obviously depends on what the Flood was like in the White Mountains. Did the precipitation which accompanied the Flood fall as rain or snow in this high altitude region? How long would the bristlecones likely have been inundated by the Flood? During what season or seasons of the year would they have been inundated? Clearly, the more knowledge about the Flood we can take with us into the present search, the more successful the search for the Flood in these geophysical reservoirs is likely to be.

Many of the questions about the Flood which

¹Gerald E. Aardsma, *A New Approach to the Chronology of Biblical History from Abraham to Samuel*, 2nd ed. (Loda IL: Aardsma Research and Publishing, 1993).

arise at the present time can not be answered with any degree of certainty. It is to be expected, in fact, that the present search will itself add significantly to our knowledge of the Flood. But a few questions about the Flood can be answered with a high degree of reliability even now, and at least a probable answer can be given to many others. This results mainly from the record of Noah's observations of the Flood which is preserved for us in the seventh and eighth chapters of Genesis.

Noah's Calendar

The narrative of the Flood found in Genesis chapters 7 and 8 contains a number of very important time references. For example, in Genesis 7:11 we read (NASB):

In the six hundredth year of Noah's life, in the second month, on the seventeenth day of the month, on the same day all the fountains of the great deep burst open, and the floodgates of the sky were opened.

Such time references constitute the basis for the historical chronology of the Flood event. However, these are obviously not references to the Gregorian calendar which we now employ for keeping track of days, weeks, months, and years, since it was only in A.D. 1582 that the Gregorian calendar came into existence. There have been many different calendars in antiquity, and the fact is that we do not know what calendar Noah used. Most importantly for the present study, we do not know how many days were in each of its months, and we do not know how many months comprised a year.

These basic unknowns give rise to an unavoidable uncertainty in any attempt to fix the events of the Flood on the time line. However, variations in ancient calendar systems of the Middle East are



Figure 1: The relative positions of sun, moon, and earth during the new moon phase. The rotational axis of the earth is perpendicular to the page, and the figure is viewed from above the north pole. Nothing is to scale.

sufficiently small to suggest that even in the worst case a cumulative error of only one or two weeks should be expected from any reasonable modern rendering of the chronology of the Flood.

While we do not know the lengths of a year or of the months in Noah’s calendar, it seems highly probable that they were linked to observed natural phenomena. “Day” is naturally defined as a single period of light and darkness, caused by the rotation of the earth on its axis. “Month” finds its most natural definition in the revolution of the moon about the earth, a new month beginning with the first appearance of a crescent moon at dusk following its complete absence at night due to its close alignment with the sun (Figures 1 and 2). And similarly “year” finds its most natural definition in the revolution of the earth about the sun which gives rise to the observed annual cycle of seasons.

These natural definitions—which I will assume were the ones Noah used as I draft the following chronology of the Flood—though lacking in quantitative precision relative to modern scientific standards, would almost certainly function adequately for the day-to-day activities of people in the pre-Flood world. In fact, they seem to have been the original starting point from which all calendars of the Middle East in the post-Flood era were later devised. They are also obviously harmonious with the Divine purpose, articulated at Creation, that the sun, moon, and stars should be “for seasons, and for days and years”.²

²Genesis 1:14. Notice that the moon plays only a minimal time-keeping role in Western calendrical practices today (associated with the timing of religious holidays), in sharp contrast to the prominent role it played in many ancient calendar systems.

These natural definitions have several interesting consequences. For example, they imply that the concept of “year” would be attached to the natural cycle of seasons rather than to any arbitrary count of days. Thus, the number of days comprising a year could vary slightly from year to year, but the long-term average would equal the mean solar year, which measures 365.2422 days at present. An important result is that the measured “years” of Noah’s life recorded in Scripture, as well as those of the other pre-Flood patriarchs, would probably approximate solar years just about as closely as the “years” of our lives do according to current calendrical practices.

Unlike our modern calendar, however, one year would not divide neatly into twelve months. The observed period from one new moon to the next is called the synodic month. The synodic month is variable, but averages 29.530588 days. Twelve synodic months equals 354.3671 days, which is 10.8751 days short of a solar year. Thus, in this natural system of reckoning time, months would not be expected to be synchronized with the solar year at all.

In actual practice, with the beginning of each new month determined by observation, months would also vary in length between 29 and 30 days in an irregular way. However, the long-term average would equal the average synodic month of 29.530588 days.

This all seems somewhat complicated, no doubt, but it amounts to a very simple and natural way of reckoning time in actual practice. For example, in this system Genesis 7:11, quoted above, simply means that the Flood began on the seventeenth day following the second new moon to be observed by Noah (or his contemporaries) in his six hundredth year.

Throughout the remainder of this article I will present such dates in the format “year of Noah’s life/lunar month/day of month”. In this format the calendar date in Genesis 7:11 is written as 600/02/17.

Day Counts

Several “day counts” are used in place of calendar dates in the Biblical narrative of the Flood: the initial forty days and nights of rain, the 150

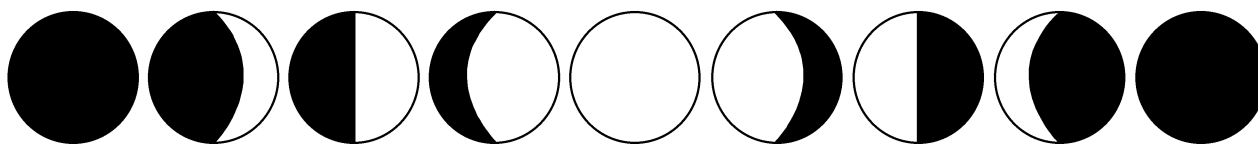


Figure 2: The phases of the moon from one new moon to the next. From left to right these are called: new, crescent, first quarter, gibbous, full, gibbous, last quarter, crescent, and new. The first appearance of the crescent following the new moon is a point in this cycle which can be determined with relatively little ambiguity. Hence it serves as a good point from which to begin successive lunar months. At this point the moon is viewed at dusk, setting in the west, shortly after the sun has gone down.

days during which the Flood prevailed, and several counts in connection with the sending out of the birds from the ark. This is to be expected in such a natural calendar system. The presence of such counts supports the suggestion that this was the calendar which Noah actually employed.

According to the lunar calendar postulate, Noah's calendar depended on his being able to see the new moon, to mark the beginning of each month. Obviously, this would not always have been possible. For example, it would not have been possible during the forty days and nights of rain at the beginning of the Flood. While Noah would easily have been able to keep a running tally of how many days it had rained, he would not have been able to give an accurate calendar date for when the rain stopped. The rain itself would have prevented observation of the moon and, hence, it would have prevented determination of the exact day when the third month began. I suggest that this is the reason Noah recorded the number of days it rained, rather than the calendar date when the rain stopped.

Visibility

Further support of the lunar, observational calendar thesis results from another, somewhat opposite observation. There are two calendar dates in the Flood narrative which, in a lunar calendar, would necessarily coincide with the appearance of the new moon: 600/10/01 in Genesis 8:5 and 601/01/01 in Genesis 8:13. If the lunar calendar thesis is correct, then atmospheric conditions on these two days would need to have been sufficiently clear for the new moon to be observed, to

tell that the new month had begun.

In actual fact, in both instances observations are recorded which seem to imply clear conditions. Visibility was obviously good on 600/10/01, for Genesis 8:5 tells us that on that day the tops of neighboring mountains were seen. Similarly, on 601/01/01 Noah removed the covering of the ark and observed that "the surface of the ground was dried up". Presumably this "surface of the ground" is a reference to the plane below the mountain upon which the ark had come to rest, since Noah would already have known the surface of the ground on the mountain itself was dry, both from the appearance of the neighboring mountains whose tops had become visible two months previously, and from his dove experiments. Thus, good visibility is again implied.

Duration of the Flood

No matter what calendar one assumes Noah used, the total duration of the Flood was obviously about one year. The Flood began on the seventeenth day of the second month of Noah's six hundredth year (Genesis 7:11), and Noah and his family disembarked after the Flood on the twenty-seventh day of the second month of his six hundred and first year (Genesis 8:13-19).

Interestingly, however, when the natural calendar I have described above is assumed, the duration of the Flood comes out to be *exactly* 365 days. This, of course, is the length of the solar year (i.e., 365.2422 days) rounded to the nearest whole number of days.³

³To see this, multiply the average synodic month of 29.530588 days by twelve to count the days from the begin-

Thus it appears possible that the Scriptures mean to convey that Noah and his family were aboard the ark *exactly* one year.

This conclusion may find additional support from the Septuagint version of the Old Testament. Its reading of Genesis 7:11 and 8:14 is essentially the same as the reading of the Hebrew text (from which our English Bibles derive) with the single exception that in the Septuagint the Flood begins, not on the seventeenth day of the second month, but on the twenty-seventh day. This causes the Flood to both begin and to end on the same day of the same month of consecutive years. For those, like ourselves, who use a solar based calendar, events which begin and end on the same day of the same month separated by one year are immediately recognized to be one year long. I suggest the Septuagint reading in Genesis 7:11 may have been deliberately changed from “seventeenth day” of the Hebrew text to “twenty-seventh day” of the Septuagint for precisely this reason. I suggest that the Septuagint audience may have been familiar with a solar rather than a lunar calendar, and that Genesis 7:11 may have been changed in the Septuagint to communicate to this audience the fact that Noah and his family were aboard the ark exactly one year.

I have previously shown that the date of the commencement of the Flood appears, from Biblical data, to be 3520 ± 21 B.C.⁴ We must, therefore, date the disembarking from the ark to 3519 ± 21 B.C.⁵ These dates provide a functional chronological alignment of the Flood with respect to world

ning of the seventeenth day of the second month of Noah’s six hundredth year to the beginning of the seventeenth day of the second month of Noah’s six hundred and first year, then add eleven days to go from that point to the end of the twenty-seventh day. The result is $29.530588 \times 12 + 11 = 365.367056$ days.

I was introduced to this interesting fact several decades ago by a little tract called *Discovering the Calendar of the Creation*. [William G. Lowe, *Discovering the Calendar of the Creation* (Narrowsburg, New York: Scripture Truth, 1971).]

⁴Gerald E. Aardsma, “Chronology of the Bible: 5000–3000 B.C.,” *The Biblical Chronologist* 2.4 (July/August 1996): 3.

⁵The quoted uncertainties on these two dates are understood to be correlated rather than independent. The fundamental Biblical datum is that the Flood lasted one year, so the dates of commencement and termination of the Flood must always differ by one year only.

history, as well as adequate boundaries for containment of the more detailed events of the Flood.

Detailed Chronology of the Flood

I have arranged the events of the Flood, recorded in Genesis chapters 7 and 8, in the time chart shown in Figure 3. The absolute (B.C.) dates discussed above are shown above and below the chart. This placement is deliberately chosen to convey the idea that precise alignment of the chart with respect to the Gregorian calendar months is presently unknown.

The time scale is given in the leftmost column of the figure as a day number count. In the neighboring column to the right I have placed Noah’s date references at their appropriate day number. These are given in the format “year of Noah’s life/lunar month/day of month” as mentioned above.

The Flood Begins

Genesis 7 opens with God’s command to Noah and his family to enter the ark and board the animals. This command was given seven days prior to the beginning of the Flood.

Once Noah and his family had been shut safely inside, the Flood began on 600/02/17, evidently with nonstop rain and the simultaneous rising up of water from the oceans onto the land. This release of water over what had previously been dry land continued for forty days.

An Interpretive Interlude

Sedimentary data from Elk Lake in Minnesota strongly support the global Flood interpretation of Genesis 7 and 8.⁶ But interpretive questions regarding the geographical extent of phenomena associated with the Flood still arise within the global Flood framework. For example, did the forty days and nights of rain, first mentioned in Genesis 7:4, fall everywhere all over the earth, or was this particular manifestation of the Flood peculiar to Noah’s region?

Such questions are of considerable importance at present. Obviously, forty days and nights of precipitation would be expected to leave a marked ef-

⁶Gerald E. Aardsma, “Noah’s Flood at Elk Lake,” *The Biblical Chronologist* 2.6 (November/December 1996): 1–13.

3519±21 B.C.

day	Noah's date	event	Genesis
365	601/02/27	disembarking	8:14
		waiting	
310	601/01/01	covering of ark removed; water gone	8:13
283		dove sent out third time	8:12
276		dove sent out second time	8:10,11
269		dove sent out first time	8:8-10
262		raven sent out	8:6,7
		water still receding	
222	600/10/01	tops of mountains become visible	8:5
		water decreasing steadily	8:5
150	600/07/17	ark rests upon the mountains of Ararat	8:4
		water "prevailed"	7:24; 8:3
40		40 days and nights of rain ends	7:4,12,17
		raining; flooding	7:10-12,17-20
1	600/02/17	Flood begins	7:11

3520±21 B.C.

Figure 3: Chronology of Noah's observations of the Flood.

fect on the Greenland ice sheet for example.⁷ Forty days and nights of rain would be expected to produce some significant melt-back of the uppermost snow and ice layers, and the penetration of meltwater into cracks and fissures and subsequent refreezing would probably alter the physical character of the underlying ice to some depth as well.

Forty days and nights of snow would have somewhat of an opposite effect. It would be expected to produce an unusually thick annual ice layer, but would not be expected to disturb the stratigraphic sequence of layers or to alter the usual physical characteristics of underlying ice in any way.

Clearly, if we can be certain from the text of Scripture that the forty days and nights of precipitation was a global phenomenon, then the Greenland ice sheet would be virtually guaranteed to strongly reveal the Flood in its vast record of annual snow accumulation in Greenland.

One may or may not feel certain about this scientific question (of the geographical extent of phenomena associated with the Flood) depending upon how they view the overall context of Genesis chapters 7 and 8. If one adopts the perspective that Genesis 7 and 8 record God's omniscient, omnipresent observations of the Flood, then many of the phenomena mentioned in these chapters appear to be global. If, however, one adopts the perspective that Genesis 7 and 8 record Noah's accurate but finite observations of the Flood, then one finds that the question of the geographical extent of many of the phenomena mentioned in Genesis 7 and 8 cannot be settled with certainty from the Biblical text alone.

I personally lean very heavily toward the latter perspective. My reason for this comes out of my study of these chapters over several decades. I have come to see Noah as somewhat of an early scientist—his ability to construct such a vessel as the ark, his ability to care for the many different types of animals which God sent to him, and his design and execution of the bird experiments all contribute to this impression—and, as a scientist myself, I find it difficult to escape the feeling that I am simply reading observations which Noah jot-

ted down in his science notebook through much of Genesis 7 and 8. I would add to this that the referencing of calendar dates to Noah's own birthday adds further to the impression that these are, in fact, Noah's personal observations of the Flood. In any event, I feel the reader needs to be aware that this perspective underlies and permeates the following discussion.

An important consequence of this perspective is that the chronology of the Flood, shown in the time chart of Figure 3, can not be applied simultaneously to every point on the surface of the globe. This is understood to be the chronology of *Noah's* experience of the Flood, not a universal chronology of the Flood equally applicable to the whole globe.

For example, the observation that the tops of the mountains became visible on 600/10/01 does not mean that one would have first observed mountains on that day no matter where they were situated on the earth. Similarly, the forty days and nights of rain must be regarded as a local, rather than a global observation. This by no means precludes the possibility of forty days and nights of rain elsewhere on the globe or even over the entire globe—what Noah observed locally may have been part of a global phenomenon. Indeed, as we have seen, the Flood itself, though only locally observed by Noah, certainly appears to have been a global phenomenon. The forty days and nights of rain may also have been a global phenomenon, but it appears to me to be an interpretive error to jump to this conclusion on the basis of the Biblical account of the Flood alone.

The Water Prevails

The word “prevailed” occurs three times in the last seven verses of Genesis chapter 7. This word is used each time in reference to the water of the Flood—we are told that the water prevailed 150 days. What does this mean?

The same Hebrew word is used of the battle between the Israelites and the Amalekites in the desert of Sinai after Israel had left Egypt. This battle, recorded in Exodus 17, is the one in which “it came about when Moses held his hand up, that Israel prevailed, and when he let his hand down, Amalek prevailed”.

⁷Simple chronological considerations show that the Greenland ice sheet definitely existed before the Flood. This conclusion, in turn, falsifies the postulate that the pre-Flood climate was globally warm.

I suggest that the use of “prevailed” in Genesis 7 has the same connotation as its use in Exodus 17. That is, Noah has in mind the metaphor of a mighty struggle between the dry land and the water. From the first day until the one hundred fiftieth day of the Flood the water appeared to be winning the battle, but from day 150 onward the earth was winning.

The event which marked the turning point in this struggle appears to have been the grounding of the ark on the mountain. Even though the view from the window of the ark would have revealed only water at this point, as it had for many months previously, contact with terra firma had been reestablished. When the ark failed to lift off the mountain again, but rather proceeded to slowly settle in place, no doubt accompanied with some tilting of the decks, it would be clear to Noah that the Flood was waning and the water was winning no longer.

This suggests that the day count given in Genesis 7:24, informing us that “the water prevailed upon the earth one hundred and fifty days” should coincide with the calendar date of 600/07/17 given in Genesis 8:4 for the grounding of the ark upon the mountain. This, in fact, works out very well. It requires only that four of the five synodic months which completed between the start of the Flood on 600/02/17 and the grounding of the ark on 600/07/17 had thirty days and one had twenty-nine days. In his *Handbook of Biblical Chronology* Jack Finegan displays a table of the actual month lengths recorded during the first nineteen years of the reign of Nebuchadrezzar II of Babylon.⁸ I found twenty-four occurrences of five consecutive months in which four were thirty days long and the remaining one was twenty-nine days long in this table.⁹ Thus, it appears correct to equate the calendar date, 600/07/17, with day 150 even though the text does not explicitly do so.

⁸Jack Finegan, *Handbook of Biblical Chronology* (Princeton: Princeton University Press, 1964), 32.

⁹It should be pointed out that this month length pattern may eventually help to pinpoint the exact year and even the exact day relative to the Gregorian calendar when the events recorded in Genesis 7 and 8 took place. I say “may” for several reasons, not the least of which is the Biblical indication of possible Divine tampering with the “hands” of the astronomical clock during Joshua’s long day (Joshua 10:12,13) and Hezekiah’s sign (2 Kings 20:8–11).

The Flood Subsides

As noted above, the turning point in the narrative of the Flood occurs when the ark is grounded in the mountains of Ararat. From that point on it is clear to Noah that the Flood is in retreat.

On 600/10/01 the tops of neighboring mountains become visible for the first time. The impression from Genesis 8:5 is that this is due to the Flood decreasing sufficiently for the tops of neighboring mountains to finally poke out above the surface of the Flood water, like the Pacific islands which poke out above the surface of the Pacific ocean today.

Forty days later Noah began his series of bird experiments. The purpose of these experiments was clearly to ascertain living conditions outside the ark, as noted by many commentators.

Neither a date nor a day count is given in relation to the sending out of the first dove. However, Genesis 8:10 says in relation to the sending of the dove the second time, “So he waited yet another seven days; and again he sent out the dove from the ark”. This seems to imply that there was a seven day interval between the sending of the raven and the sending of the dove the first time. I have assumed this is the case in the time chart of Figure 3.

The day counts given in relation to the sending out of the raven and doves (Genesis 8:6–12), and absence of calendar dates for these experiments, may indicate that observation of the new moon was obscured by overcast conditions for both the eleventh and twelfth months. I must emphasize that the use of a lunar calendar has been assumed, not proven, and the idea that day counts are given in place of calendar dates at some points in the narrative due to Noah’s inability to observe the new moon on certain days is inference, not fact. Nonetheless, it is somewhat fascinating to observe that if this assumption and this inference are correct, then they allow us to deduce meteorological conditions on certain days during the Flood, even though those conditions are not explicitly given by the narrative and even though those days are five and a half thousand years remote from us.

On another tack altogether, notice that the date reference, 601/01/01, on which the covering of the ark was removed, probably does not refer to Noah’s six hundred and first birthday. Rather, in the

calendar assumed here, it means merely the day in which the first new moon of Noah's six hundred and first year was observed. Noah could have turned 601 anywhere during the preceding lunar month.

Disembarking

One of the most fascinating aspects of the chronology of the Flood, belying the prevalent modern notion that the Flood narrative is myth, is Noah's obvious timidity about leaving the ark. This is not explicitly mentioned in the narrative, but it comes through pretty clearly when the chronology of the Flood is considered.

One can imagine that conditions inside the ark were not all that pleasant. The ark is often pictured as something of a happy floating zoo in children's story books, but a floating barn would probably be a more accurate image. Practical considerations suggest the ark was probably a rather smelly place soon after the animals had boarded, and that it only got worse with time. Yet, even though Noah learned from his third experiment with the dove that conditions were livable outside the ark, he still waited another twenty-seven days before venturing to remove the covering of the ark on 601/01/01 to get some fresh air and have a good look around outside. And even though, having done so, he could now plainly see that the earth was dry all around, he still remained in the ark another fifty-five days—nearly two months—until God Himself commanded him to leave.

The implication here seems clear. Obviously, apart from a special revelation from God, Noah had no way of knowing whether the Flood was over. In the absence of such a revelation he was clearly fearful that the Flood which had swallowed the world so quickly and completely once might suddenly return to do so again. His strategy was obviously "better safe than sorry", even if it meant having to cope with a considerable degree of unpleasantness.

And in due time, on 601/02/27, the special revelation Noah needed was given, and Noah, his family, and the animals disembarked at long last. The ark had done its job, sheltering them successfully for 365 days. The year of God's judgment was now past, and they had God's promise that there would

never again be another year like it:¹⁰

While the earth remains,
Seedtime and harvest,
And cold and heat,
And summer and winter,
And day and night
Shall not cease.

◇

Readers Write

Research Thrust

Dear Dr. Aardsma,

Will your research be primarily in the area of pre-Davidic history, or will you ever touch on other topics? I am thinking of more common historical debates such as the chronology of the life of Christ, early New Testament church, post-Davidic events, and the dating of when certain prophets wrote their books.

Karl Wiensz
Rickreall, OR

Dear Karl,

Some time ago I made a poster and hung it up by my desk in my office. It is designed to keep me on track. It looks like this:

My Goal

To harmonize Biblical and secular historical and scientific chronologies of earth history from the present back to the beginning of the creation.

I will have reached the goal when there is no longer any conflict between Biblical and secular chronologies of earth history.

Because there is no real *conflict* between Biblical and secular chronologies in the post-Davidic period, my research into chronological matters from 1000 B.C. to the present is likely to be minimal for some time to come.

¹⁰Genesis 8:22; NASB.

There is, as I am sure you know, a rather large conflict between traditional Biblical chronology and secular chronologies of earth history relative to the antiquity of man and the age of the earth. The Bible seems to date the creation of Adam to around 5000 B.C. Meanwhile, archaeologists have uncovered whole towns which appear to predate this by at least 3,000 years, and the age of the earth itself is currently estimated at 4.5 billion years.

Radiometric methods form almost the entire basis of secular chronologies prior to 3000 B.C. My formal physics training has equipped me to understand, properly respect, and critically evaluate these methods. It is in relation to these methods that I feel I can contribute most to Biblical chronology issues. The role played by radiometric dating methods in secular chronology building diminishes as one moves from 3000 B.C. toward the present. Thus, my particular background is best suited to Biblical chronology issues prior to about 1000 B.C.

The strategy for my research is to systematically extend the region of harmonization between sacred and secular chronologies of earth history to ever earlier times. A decade ago there was no harmony prior to 1000 B.C. At present the frontier has been pushed back to 3500 B.C.—the Lord has clearly blessed!

But, as my poster shows, Genesis 1:1 is the ultimate objective. So you should expect my research to concentrate on the present frontier and press toward ever more remote times. I would expect to treat post-Davidic matters only rarely.

Gerald E. Aardsma, Ph.D.
Loda, IL

Noah's Flood

The following letter was written in October 1996, in reference to the "Research in Progress" column of the July/August 1996 issue of The Biblical Chronologist (Volume 2, Number 4). In that column I showed how sedimentary data from Elk Lake in Minnesota combine with Biblical chronology data to falsify the idea, popularized by the creation/science movement in the U.S. during the past several decades, that Noah's Flood was a great overwhelming geologic upheaval in which the sur-

face of the earth was torn apart and demolished to great depth. Not surprisingly I received a number of letters from concerned subscribers arguing for the cataclysmic model. The following letter is another of this set to be published in this column. My purpose in publishing these is to provide for open, candid discussion of the cataclysmic model.

Dear Dr. Aardsma,

Your article on the Noachic Flood in the latest issue of *The Biblical Chronologist* has given rise to a number of questions. Maybe I should wait for the next installment before writing, but these questions weigh heavily upon me. I have done no specific research for this letter; the questions and assertions come off the top of my head, so there may be some errors, and most of the time I won't be telling you anything you don't already know.

First, let me consider the Flood via the Bible. Genesis does not say explicitly that the Flood was both global and cataclysmic, yet it strongly implies that such was the case. The statement, "the floodgates of heaven were opened" does not seem to describe a mere heavy rain, but rather a torrential downpour where one would think he was standing under a huge waterfall. All the water in the atmosphere today couldn't even start a flood like that described in the Bible. Besides, don't you think there is good reason to postulate the existence of a vapor or ice canopy that enveloped the planet before the Flood ("the waters above the firmament")? The resultant greenhouse effect would provide the vegetation for today's oil and coal deposits, and also provide a favorable environment for the dinosaurs and other large herbivores. The cataclysmic end of this protective canopy ("the floodgates of heaven were opened") could explain the sudden demise of the dinosaur, etc. Then there is the statement "the fountains of the deep burst open." This certainly sounds like the encroachment of the ocean in a cataclysmic way. Finally, the mountains being topped by the water would seem to indicate a planet-covering flood. The Bible says, "All the high mountains which were under all the heavens were covered."

Next, let me consider the "book of nature." It seems to me that it is here that we get the most convincing testimony of a global cataclysm. There are caves and crevices scattered about on the earth

each abounding in fossilized animals of a wide variety from various climate zones, all thrown *together* in a chaotic state. There are huge tectonic uplifts with fossils of “highly evolved” marine life in the uppermost regions. There are the instantaneously frozen mammoths of Siberia, the flesh of which when discovered was fresh enough to be eaten by dogs, and whose stomachs contained plants from a temperate climate zone. Finally, there are the deposits of coal and oil which are so immense as to boggle the mind that are deep under sedimentary rock and are under great pressure. . .

Ken Wilson
Baltimore, MD

Dear Ken,

Since receiving your letter, several more issues of *The Biblical Chronologist* have been mailed, so you are now better acquainted with what the scientific data related to the Flood which I have been studying are revealing about that event. Specifically, we both agree that the Flood was a global event, so that matter needs no further discussion here. It is only the geologic potency of the Flood which is in question.

I suggest we are also in rough agreement regarding the relation of the cataclysmic Flood model to the Bible. The main point I tried to make in the introduction to my article on Elk Lake was that the claim that the *Bible* teaches the Flood was cataclysmic is false. I made this point by arguing: 1. that mention of the sorts of phenomena which would characterize such a cataclysm (earthquakes, volcanoes, tidal waves, etc.) is conspicuously absent from the Genesis account of the Flood; 2. that the phrase “floodgates of the sky” was clearly metaphorical, and the parallel phrase “fountains of the great deep” should therefore also be understood as a metaphor—these can not legitimately stand as proof of a cataclysmic Flood; and 3. that the only way the cataclysmic Flood model can be attached to the Bible is through a fallible and potentially incorrect process of human inference.

You state that “Genesis does not say explicitly that the Flood was . . . cataclysmic”. So I think we are in essential agreement on points 1 and 3 above. And I am not sure we are too far apart on point 2. When you state that the phrase “floodgates of the

sky” means “a torrential downpour” you are interpreting the phrase metaphorically—you are not suggesting we should look for literal dams in the sky.

I conclude that we differ, in fact, only over the science issues, not the Bible issues. You may find this surprising, since the introductory statement in your second paragraph claims that the Bible strongly implies the Flood was cataclysmic, which claim I certainly disagree with. But I would suggest that you have presented no argument in your letter to substantiate this claim.

If you dissect your second paragraph, which explains why you think the Bible implies the Flood was cataclysmic, you will find that you are mainly discussing scientific notions which you have attached to the Bible rather than what the Bible in and of itself says or implies. You mention vapor and ice canopies (which the Bible nowhere explicitly mentions), the water-holding capacity of today’s atmosphere (which the Bible does not discuss), the greenhouse effect (also not mentioned in the Bible), the origin of oil and coal (similar fate), and the extinction of the dinosaurs (also not discussed in the pages of Scripture). Having read your second paragraph I am still left with the question, “But where does the *Bible* strongly imply that the Flood was a cataclysm?”

The metaphorical expression, “the floodgates of heaven were opened”, which you mention, may imply a torrential downpour as you suggest, but a torrential downpour is not a globe-shattering cataclysm. The metaphorical expression, “the fountains of the great deep burst open” may imply encroachment of the oceans over the land, but that is a far cry from tidal waves and earthquakes and volcanoes and mid-oceanic rifts opening up and ocean floor sinking into the mantle of the earth and the surface of the earth being torn up and redeposited as mile-deep sediments all over the globe. I repeat: “Where does the *Bible* strongly imply that the Flood was a cataclysm?”

I suggest that once you have properly separated what the text of Scripture actually says from the strictly scientific notions you have been taught to import into your reading of Scripture you will find that we are actually in agreement regarding the relation of the cataclysmic Flood model to the Bible. So it is only the science which is at issue.

You are correct that I am well familiar with the scientific claims you have advanced in your letter. They can be found everywhere in modern creation/science literature of the sort which is intended for non-specialist audiences. As a former employee of The Institute for Creation Research in San Diego (I taught Physics in the ICR graduate school for eight years) I have had opportunity to examine some of the current “lay” creationist literature close up, and I am afraid that I cannot advise putting much faith in much of it.

I am hardly the first or the only one to have made this observation. For example, a scientist friend, much my senior, and devoted to and active in the creation/science movement for many years (now retired) observed in a letter to me in December 1991:

There is much creationist literature that is highly regarded by [lay] individuals, but which only brings Biblical creationism into disrepute among scientifically competent individuals who do not share the theological commitment this literature attempts to serve.

I urge you to check out the well-known “facts” you are using to formulate your model of the Flood. For example, are you sure the mammoths of Siberia were “instantaneously frozen”? Do you know of any tests which were run to determine just how quickly they were frozen? Did you see the results of these tests yourself, in some first-hand science publication? Are you quite sure the “stomachs contained plants from a temperate climate zone”? Can you back this claim with a science publication by an individual who examined the stomach contents and had sufficient training to know what he was looking at? Similar questions apply to your other assertions.

I do not mean to put any blame on you for these assertions. You have, in the first place, plainly stated that these “assertions come off the top of [your] head, so there may be some errors”. And, in the second place, you have not invented these ideas; you are merely repeating what you have been told by others. But just as you would be well-advised to inspect the foundation of a home you were considering purchasing, I am advising you to take a critical look at the foundational “facts” you

are building your view of the Flood upon. I think you will be surprised to find how little confidence most of them actually warrant.

But I do not wish to dwell on this unhappy topic. There is another unhappy topic, much more germane to the purpose of this newsletter, which I must move to in closing.

There are times when a teacher feels somewhat of a failure, and your letter has definitely had that kind of impact on me.

I have spent a good deal of time and effort in this newsletter explaining why it is important to put chronology first if one wishes to discover the truth about history. I have tried to stress this because it is an essential. But I have apparently failed to get the point across.

Please note that you have lumped the formation of fossils, the origin of tectonic uplifts, the freezing of mammoths, the formation of coal and oil, and even the extinction of the dinosaurs all together into the brief year of the Flood. I am happy to think with you along such lines—no hypothesis is too far-fetched to be worthy of sober consideration, in my opinion. But I must insist on one thing. I must insist that we abide by Rule #1.¹¹ I must insist that *chronology must precede history*.

Where is your chronological data? Where is the physical chronological evidence that all of these things happened 5,500 years ago? Indeed, where is the chronological evidence that they even all happened at the *same time*?

Please show me that evidence first. If it stands up to rigorous analysis, then we can move on to the implications of all these things for the Flood. Otherwise I must conclude (and so should you) that there is no logical reason to suppose they have anything at all to do with the Flood, or even with one another, no matter how compelling the story which one may compose with them may seem to be.

Gerald E. Aardsma, Ph.D.
Loda, IL

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¹¹Gerald E. Aardsma, “Biblical Chronology 101,” *The Biblical Chronologist* 2.3 (May/June 1996): 10.

Research in Progress

Where did the water which covered “all of the high mountains everywhere under the heavens” during the Flood come from?

I have read or heard, at one time or another, a number of different ideas designed to answer this question in whole or in part. For example, some have proposed that ice rings, similar to those which orbit Saturn at present, once orbited Earth and that these collapsed at the time of the Flood. Others have suggested that Earth’s atmosphere once supported a thick, global blanket of water vapor which condensed and rained down at this time. Others have postulated that great underground reservoirs of water burst open at the start of the Flood and discharged their contents onto the surface of the globe. Still others have proposed that the principle sources—and sinks—of the Flood waters were the world oceans.

Most of the ideas mentioned above exhibit serious difficulties of one sort or another when analyzed quantitatively using known physical laws. But the fact is that an entirely satisfactory scientific explanation of the rise of the Flood waters and their eventual retreat has yet to be found. So for the present investigation I will ignore the relative merits or otherwise of these ideas and treat each as a viable possibility. The thrust of the present article is simply to point out that radiocarbon has something to say about this question, and to show what it is that radiocarbon says.

Last issue I used the first nine radiocarbon measurements shown in Table 1 to determine the fraction of annual sedimentary layers which have gone uncounted in laminated sediment cores taken from Elk Lake in Minnesota. I found that 17% of the annual layers were missing from the Elk Lake layer counting chronology on average.¹² When the layer

¹²Gerald E. Aardsma, “Noah’s Flood at Elk Lake,” *The Biblical Chronologist* 2.6 (November/December 1996): 1–13. Note that the “33” in Equation (2) and subsequent text on page 12 of original issues should be corrected to “23”. This has now been corrected in the master, so those who have obtained Volume 2, Number 6 as a back-issue will find “23” already. Note also that a paper which I submitted to *Radiocarbon* dealing exclusively with radiocarbon’s implications for missing annual layers in the Elk Lake chronology has been reviewed and accepted for publication. This substantiates the method of analysis used to establish the missing annual layers. The change of the “33” to “23” in Equation

Table 1: Uncalibrated radiocarbon dates on samples from Elk Lake.

	lab #	layer #	¹⁴ C age (yr B.P.)	
1	QL4018	0	420 ±	60
2	QL4017	88	1,160 ±	65
3	QL1560	648	1,420 ±	80
4	QL1561	1,100	2,270 ±	80
5	QL1562	2,216	3,360 ±	70
6	QL1493	2,317	3,190 ±	100
7	QL1563	2,634	3,370 ±	70
8	QL1492	2,666	3,660 ±	130
9	QL1564	2,731	3,510 ±	90
10	QL1565	5,084	5,750 ±	120
11	QL1494	5,654	5,290 ±	100
12	QL1566	6,694	7,880 ±	50
13	QL1495	7,983	8,550 ±	140
14	QL1496	9,061	9,830 ±	150
15	QL1497	10,500	11,380 ±	180
16	QL1498	unlayered	17,000 ±	800

counting chronology was corrected by the restoration of these missed layers, the Flood was found to coincide with the end of an anomalous interval of 600 layers in the Elk Lake core. Examination of these 600 layers led to the hypothesis that they did not represent 600 *annual* layers, but rather that they had all been deposited in a short space of time as a result of Noah’s Flood.

The tenth radiocarbon measurement in Table 1 is for a sample taken from layer 5084, roughly in the middle of the Flood deposit.

Working within the pelagic Flood model (recall: “pelagic” means “like the open ocean”), the 600 layers which constitute the Flood deposit are known from Biblical chronology to all date to 3520±21 B.C.¹³ The radiocarbon age of a sample taken from these layers will contain two components: the actual age of the sample, and the old

(2) [first pointed out by Tom Godfrey, a *BC* subscriber] occasioned a careful review of the entire calculation and simultaneously a more detailed analysis. The only impact of this was to increase the fraction of missing layers from 17.0% to 17.6%. This rounds to 18%, which is how it appears in the paper accepted for publication by *Radiocarbon*.

¹³Gerald E. Aardsma, “Chronology of the Bible: 5000–3000 B.C.,” *The Biblical Chronologist* 2.4 (July/August 1996): 2–3.

carbon contribution.¹⁴ The old carbon contribution to the radiocarbon age of these layers is the quantity of interest in the present investigation. It has potential for telling us something about where the column of water which existed above Elk Lake during Noah's Flood came from.

Rain water which is collected directly from the sky will contain a small amount of carbon dioxide as carbonic acid. The carbon involved here is derived from the atmosphere and will contain no old carbon. Consequently, organisms grown in fresh rain water will have no old carbon contribution to their radiocarbon age. If the Flood waters at Elk Lake all came from fresh rain, either through the melting of ice rings or the condensation of a vapor canopy or from any other source, then the old carbon contribution to radiocarbon ages in the lake at the time of the Flood would be expected to be significantly reduced relative to its present value of 600 radiocarbon years.¹⁵

If rain water comes in contact with limestone, it can pick up old carbon atoms from the limestone. Organisms grown in rain water which has percolated through limestone can have an old carbon contribution to their radiocarbon age of hundreds of years. This, in fact, is the situation which prevails at Elk Lake today. If the column of water which existed above Elk Lake at the time of the Flood contained mostly rain water which had been in substantial contact with limestone or other sedimentary sources of old carbon, then an old carbon contribution to the radiocarbon age approaching that of the modern lake might be expected.

Underground reservoirs of water are more difficult to analyze because their physical circulation is not clear. If they were sealed off from the atmosphere they would be expected to contain essentially no radiocarbon and thus they would be expected to exhibit a very great old carbon effect, probably in excess of forty thousand years. If, on the other hand, they mixed with surface waters, then they would be in much the same class as modern lakes, and an old carbon contribution on the

order of centuries might be expected.

A different prospect presents itself if the water above Elk Lake at the time of the Flood was principally from Earth's oceans. Modern samples grown in equilibrium with surface ocean water have yielded radiocarbon ages from essentially zero to as much as 885 radiocarbon years, depending upon the geographical location from which the samples were taken.¹⁶ But the surface waters of the oceans constitute only a small fraction of the total volume of water residing in the oceans today. Most ocean water resides in the deep ocean.

The Geochemical Ocean Sections Study program (GEOSECS) measured radiocarbon concentrations at all depths in the world oceans and found that: "The average $^{14}\text{C}/^{12}\text{C}$ ratio for the ocean is about 15% depleted with respect to the preindustrial atmosphere".¹⁷ This average radiocarbon concentration converts to an average radiocarbon age for the oceans of about 1300 radiocarbon years. Organisms (e.g., fish, diatoms, clams) growing in average ocean water inherit the radiocarbon age of their environment; they will have a radiocarbon age of 1300 radiocarbon years even while they are living. (Thus, to get the true calendar age of a sample grown in average ocean water one would need to subtract 1300 years from the measured radiocarbon age.) If Elk Lake were covered by average ocean water (i.e., water which came from the deep ocean) at the time of the Flood, then the radiocarbon age of samples from the Flood layer would be expected to show an old carbon contribution on the order of a millennium.

Result

Line 10 of Table 1 contains the radiocarbon measurement on the Flood layer at Elk Lake. The measured radiocarbon age of this portion of the layer is $5,750 \pm 120$ radiocarbon years. A terrestrial sample grown in equilibrium with atmospheric carbon dioxide in 3520 B.C. (i.e., at the time of the Flood) will currently have a radiocarbon age of

¹⁴See last issue for a discussion of the old carbon contribution to the radiocarbon age of samples from lake environments.

¹⁵Gerald E. Aardsma, "Noah's Flood at Elk Lake, Technical Appendix," *The Biblical Chronologist* 2.6 (November/December 1996): 13.

¹⁶Minze Stuiver and Thomas F. Braziunas, "Modeling atmospheric ^{14}C influences and ^{14}C ages of marine samples to 10,000 BC," *Radiocarbon*, 35.1 (1993): 156 (Fig. 16).

¹⁷J. R. Toggweiler, K. Dixon, and K. Bryan, "Simulations of Radiocarbon in a Coarse-Resolution World Ocean Model: 1. Steady State Prebomb Distributions," *Journal of Geophysical Research* 94.C6 (1989): 8221.

4,744±22 radiocarbon years.¹⁸ Thus the apparent “old carbon” contribution for sample 10 of Table 1 is (5,750±120 - 4,744±22 =) 1,006±122 radiocarbon years.

One must be careful here. Experience has shown that it is not wise to base too much on a lone radiocarbon measurement. Things can go wrong during collecting, preparing or measuring a sample. One would like to see this measurement independently duplicated or triplicated before too much is made of it. Nonetheless, the following two points seem appropriate at this stage.

First, this single measurement is supportive of the pelagic Flood model, which pictures Noah’s Flood as characterized, not by catastrophe and overwhelming upheaval of the crust of the earth, but simply by all lands being submerged beneath water, as if the world were covered everywhere by a single world ocean. Furthermore, this measurement is harmonious, not with the notion that some of the surface water of the oceans spilled out over the land, but with the idea that the continents were buried for a period of time by water which had actually come from the deep ocean basins.

Second, this model leads to the suggestion that the apparent inversion of radiocarbon ages between samples 11 and 10 in Table 1 (i.e., sample 10 appears older than the more deeply buried sample 11) is real rather than due to some measurement error. This apparent age inversion is explained by the sudden presence of radiocarbon-deficient deep ocean water at Elk Lake during the year of the Flood. The pelagic Flood model predicts that a more detailed set of radiocarbon measurements on the Elk Lake cores in the region of the 600 anomalous layers (i.e., the Flood deposit) would reveal a rather sudden transition to markedly *older* radiocarbon ages at the boundary into the 600 layer interval, and roughly constant radiocarbon ages throughout the interval.

This radiocarbon age-inversion signal, if corroborated at Elk Lake, could be very helpful in identifying the Flood in many other lake environments. The sediments on the bottom of most lakes are not laminated the way the Elk Lake sediments are. The laminations at Elk Lake appear to be

¹⁸Minze Stuiver and Bernd Becker, “High-precision decadal calibration of the radiocarbon time scale, AD 1950–6000 BC,” *Radiocarbon*, 35.1 (1993): 57–65.

a consequence of the great depth of the lake relative to its surface area. This, apparently, has kept the deepest portions of the lake from being sufficiently oxygenated to support macroscopic life. And this has prevented organisms from burrowing in the deep lake sediments, protecting these sediments from biological homogenization. It appears that these special conditions have not existed in most lakes—their sediments are usually found to be homogenized. In the absence of annual layering, this radiocarbon age-inversion signal may be the only way of detecting the Flood in most lake sediments from around the world. ◊

The Biblical Chronologist is a bimonthly subscription newsletter about Biblical chronology. It is written and edited by Gerald E. Aardsma, a Ph.D. scientist (nuclear physics) with special background in radioisotopic dating methods such as radiocarbon. *The Biblical Chronologist* has a threefold purpose:

1. to encourage, enrich, and strengthen the faith of conservative Christians through instruction in Biblical chronology,
2. to foster informed, up-to-date, scholarly research in this vital field within the conservative Christian community, and
3. to communicate current developments and discoveries in Biblical chronology in an easily understood manner.

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The Biblical Chronologist (ISSN 1081-762X) is published six times a year by Aardsma Research & Publishing, 412 N Mulberry, Loda, IL 60948-9651.

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