The Biblical Chronologist

WHAT HAS BEEN IS REMOTE AND EXCEEDINGLY MYSTERIOUS. WHO CAN DISCOVER IT?
(Ecclesiastes 7:24)

Volume 3, Number 6 November/December 1997

Radiocarbon Dating Noah's Flood

The day began as uneventfully as the thousands which had preceeded it. The sun, still hidden behind the hills of Moab, was slowly turning the dark sky a pastel pink. Viewed from the verdant oasis of En-Gedi, the intervening Dead Sea appeared a soft pink too. But then a line of gold appeared and slowly spread. The sun peeped above the hills at last, freely spilling its life-sustaining rays out across the land once again.

For the inhabitants of En-Gedi life was good—a pleasant succession of unclouded days filled with work and play. Soon the bleating of sheep and goats mingled with the happy shouts of children as friends and relatives went about their daily chores.

But just before noon a slight, yet prolonged tremoring of the earth began. People and animals could only stand with difficulty. For the better part of a minute they had to lean to the south to keep from falling over. But it let up at last, and with reassuring shouts of encouragement and lighthearted laughter the inhabitants resumed their activities. Earth tremors were frequent in this region and posed little threat to a people who lived mainly in tents.

But what began as just a suspicion slowly grew into a certainty over the next several hours—one felt that the whole face of the ground was slowly but inexorably tilting down toward the north. Work and play ground to a halt as the inhabitants watched in anxious amazement as the southern basin of the Dead Sea slowly went dry, its waters flooding the shoreline all along the North.

And then they heard a roar, like the roaring of a swollen desert stream after a cloudburst, yet obviously bigger. It was coming from the south end of the Dead Sea. And even as they watched, a wall of churning water, mud, foam, and debris one hundred feet high raged into the empty southern basin from the Arava valley beyond. Instinctively men and animals alike turned and fled west, away from the Dead Sea and up into the hills.

He watched the spontaneous evacuation of the oasis from his lookout atop the cliff six miles to the south. His family were all around him. He had ordered them out of the cave and to the top of the cliff following the earth tremor earlier in the day. The rock ceiling of their cave dwelling was too dangerous to remain inside at such times. They had griped at him for the inconvenience at first, but as the ground tilted and then the raging wall of water had entered the south basin they had fallen silent. He knew they were frightened and were looking to him for protection and direction.

But he was too excited to think much about that just now. As he had watched the fleeing crowd of oasis-dwellers, an idea had slowly formed in his mind. It would be risky, but he was no stranger to risk. Nature seemed to be going a bit weird just now, but the elders had told of freaky things in the past—a hundred to one all would be back to normal by morning. A little daring and a little ingenuity could pay big dividends at such times. If he succeeded in his plan he would be fabulously wealthy and his troubles would be over. With a command to his eldest son to take the family up into the hills where he would join them later he untethered the donkey and set out for the oasis.

He arrived just over an hour later and found the oasis completely deserted. But he paused at none of the empty tents, hurrying directly to the now unguarded temple. Quickly tethering the donkey at the entrance, he brashly entered the sanctuary, with sandals yet on his feet. With a feeling of exultation he snatched a beautifully worked, gleaming copper standard from its pole and then another

and another until he could hold no more. Back outside he loaded these into goatskin sacks which hung down on either side of the donkey. Working quickly he added armload after armload, returning repeatedly to the temple to scoop up anything and everything of value inside, without care or concern for what he damaged or broke in the process. Finally, when the temple had been picked clean, he set out for his cave, leading the donkey once again.

The going was uphill this time, more uphill than usual with the crazy tilting of the earth. The weight of the hoard dictated a slow pace and gave him ample time to worry. Though the Dead Sea had already risen to an unbelievable height, water continued to pour into it from the Arava. Where was all that water coming from and when would it stop?

He reached the cliff top above his cave dwelling at last, hot and sweaty. He noticed that great clouds were now forming to the north—highly unusual for this season. But he had little time to wonder. The water had entered the gorge long ago and was already half way up the cliff.

He dumped the treasure roughly from the donkey's goatskin sacks into a reed mat—part of a simple reed and rope elevator system he had designed for lowering large loads to the cave entrance below. He tied the rim of the mat shut with its straw ropes, and then secured the entire bundle in a rope harness. Carefully he lowered his treasure over the rim and out of sight.

When the proper length of rope had been let out he fastened what remained to a stake driven into the ground for that purpose. Then he began his descent along the narrow goat path which led to the entrance of the cave, leaving the donkey tethered above. At least the tilt of the earth made the cliff a little less vertical, and the path a little less precarious than usual.

Once inside his familiar home he felt a little more relaxed. Still he worked quickly. After he had dragged the bundled hoard inside and removed the harness he began to dig in the dirt floor at the north wall of the cave. Eventually his digging exposed a natural crevice in the rock. It needed just a little widening to fit the hoard. He noticed that it was growing darker inside the cave as he labored—clouds must have begun to cover the late afternoon sun.

Finally he paused, sweating profusely. In the silence he could hear the water lapping against the cliff outside the entrance of the cave. It couldn't be too far below now—its rate of rise was obviously increasing. Hurriedly he dragged the bundle over to the hole he had dug and slid it down. With considerable effort he shuffled and stuffed it into the waiting crevice. In the process the reed mat broke open and lustrous copper items spilled out into the crevice. But he had no time to care. Quickly he leaned a flat rock over the entrance of the crevice, and shoved loose dirt back into the hole.

After he had disappeared out the mouth of the cave all was quiet and still inside. The only sound was the gentle whisper of lapping water, now at the threshold, echoing around the empty walls. Moments later, as the first small trickle of briny water began to probe the cave floor, a torrential downpour broke outside.

The Cave of the Treasure

The Cave of the Treasure is located high in the face of a sheer cliff in the Judean desert, to the west of the Dead Sea. It can only be reached with the aid of ropes today, though remnants of a narrow path to the cave, descending from above, can still be discerned across the face of the cliff. From the top of the cliff to the cave entrance is a drop of about 150 feet. The floor of the gorge is yet another 750 feet below.

The archaeological crew, under the direction of Pessah Bar-Adon, had already invested one two-week season in 1960 excavating the floor of the cave. They had found that it had been inhabited over five and a half thousand years earlier, during the Chalcolithic. They had already unearthed rich finds from this period—objects made of clay, bone, stone, straw, leather, and metal as well as food remains and hearths. Because of the extreme aridity of the desert the state of preservation of the archaeological finds was excellent.

The second season had begun March 14, 1961. It would only last two weeks once again, and was now into its second week. The crew, including soldiers from the Israeli army responsible for the safety of the team, continued their meticulous, methodical removal of the dirt floor of the cave, recording each new find as it was unearthed. Most of the floor had been excavated to a depth of over five feet

Figure 1: The treasure as found. Notice the reed mat at right in which the treasure had been bundled. [Pessah Bar-Adon, *The Cave of the Treasure* (Jerusalem: The Israel Exploration Society, 1980), 15.]

when there came a most unexpected and remarkable discovery:[1]

> It was our custom to relieve from time to time those who worked in a cloud of dust inside the cave, by others who were working near its mouth. On that day it fell to the lot of one of the students, Ruth Pecherski, and one of the soldiers, Freddy Halperin, to relieve those working inside. After a short while they came upon a sloping stone covering a crevice. With hands trembling with excitement they started to take out, through a crack, a number of copper objects, all the while muttering breathlessly "there are more"!
>
> In spite of our excitement and curiosity, we had to curb our impatience and to proceed with caution, since before moving the stone we had to widen the excavation carefully and to photograph and register every detail. It was difficult to tear ourselves away from the site. We worked until nightfall, when we were forced to leave and to postpone the removal of the objects until next morning, as it was dangerous to undertake the difficult climb out of the cave in complete darkness. This was a sleepless night for us all. We waited, drawn and tense, for the morning, and the break of dawn found us back in the cave.
>
> It took us three hours to remove all the articles from their hiding place. We stood thrilled and excited at the site of the growing heap of objects, whose number and quality, strangeness and beauty of design aroused our wonder and admiration.

The archaeological team had, in fact, discovered a hoard of 429 objects, weighing some 320 pounds total, most of which were beautifully crafted of a copper/arsenic alloy (Figure 1).

[1]Pessah Bar-Adon, *The Cave of the Treasure* (Jerusalem: The Israel Exploration Society, 1980), 7.

The discovery came as a great surprise to the archaeological world. Copper objects had previously been found in Chalcolithic strata, but nowhere near the abundance and artistic level of this hoard. The archaeologists had known for decades that man first learned to smelt copper during the Chalcolithic.[2] Indeed, that is how the period had obtained its name: "chalco" referring to the earliest regular occurrence of copper implements in archaeological strata and "lithic" referring to the still abundant occurrence of stone implements. But what they had not known before the discovery of this hoard of objects was that the science of copper metallurgy had come to such an advanced stage within this period (Figure 2). David Ussishkin summarized the impact of the discovery this way:[3]

> The articles portray the mastery of the Ghassulian [Chalcolithic] artisans in the manufacture of copper objects, and their discovery drastically changes the earlier idea that the manufacture of metal was still in its infancy during that period.

How had this hoard come to be concealed in this nearly inaccessible cave in the desert? What had the copper objects been used for? Where had they come from? These questions obviously beg answers, and the archaeologists have made some helpful suggestions, as we will see below. Our knowledge of the proper relationship of Biblical and secular chronologies of earth history affords us an even greater insight into the answers to these questions. I have already shared my view regarding them in the piece of historical fiction which opens this article.

But we must turn our attention from this fascinating copper treasure to something apparently more mundane, though, in fact, equally fascinating—at least to the chronologist. We must fix our attention on the rude reed mat in which the treasure was bundled when it was thrust into its hiding place (Figure 1). And also worthy of note is a piece of wood protruding from one of the copper objects, apparently the broken end of a pole or staff upon which the object had been mounted. The fascination of these organic items lies in the fact that they allow us to radiocarbon date Noah's Flood.

Figure 2: Copper/arsenic standard from the treasure. It is hollow along the center, apparently for mounting on a pole. [Pessah Bar-Adon, *The Cave of the Treasure* (Jerusalem: The Israel Exploration Society, 1980), 45.]

The Date of the Flood

I have previously proposed that the proper Biblical date for Noah's Flood is 3520±21 B.C.[4] Working with this date we have been able to discover clear evidence of the Flood in the laminated sediments at the bottom of Elk Lake in Minnesota, and in the huge ice sheets of the Arctic.[5] Proceed-

[2]Pessah Bar-Adon, *The Cave of the Treasure* (Jerusalem: The Israel Exploration Society, 1980), preface.

[3]David Ussishkin, "The "Ghassulian" Temple in Ein Gedi and the Origin of the Hoard from Nahal Mishmar" *The Biblical Archaeologist* 34 (1971): 37.

[4]Gerald E. Aardsma, "Chronology of the Bible: 5000–3000 B.C.," *The Biblical Chronologist* 2.4 (July/August 1996): 1–5.

[5]Gerald E. Aardsma, "Noah's Flood at Elk Lake," *The Biblical Chronologist* 2.6 (November/December 1996): 1–13. Gerald E. Aardsma, "Noah's Flood at Devon Island," *The Biblical Chronologist* 3.4 (July/August 1997): 1–16.

ing in a logically consistent way with this Biblical date has led most recently to the development of a comprehensive physical model for the Flood which immediately answers several difficult questions and promises to enormously enlarge our comprehension of this historical event.[6]

But what about radiocarbon dating? Does it support this Biblically derived date for the Flood and all that follows from it?

Radiocarbon

Strictly speaking, radiocarbon can only date objects, not events. To use radiocarbon to date an event, one must supply the radiocarbon technician with an organic (i.e., once living) object which has a known temporal relationship to that event. To date the Flood using radiocarbon we need to have some object which is known to have lived very near to the time of the Flood.

A piece of wood from the ark which Noah built would be quite good, though the possibility that the wood was cut some number of decades before it was used in the construction of the ark would add a potential complication. Radiocarbon can only determine the date when a sample was living, not when it was used in a particular building project.

Grain from the ark would be better. Grain is a consumable which is not generally stored for more than one or two years before it is used. Any grain found aboard the ark would very probably have been grown in the year immediately prior to the Flood.

Unfortunately, we have neither wood nor grain nor anything else from the ark, for remains of the ark—if they yet survive after five and a half thousand years—have never yet been found (claims to the contrary not withstanding). So we need some other sample which we have reason to believe grew just shortly before the Flood.

That is where the Cave of the Treasure mat comes in. It seems to meet this need admirably.

The Mat

The Cave of the Treasure mat is made of reeds. Reeds typically are harvested very soon after they have grown, and we would expect a mat made of reeds to have a relatively short service life. Thus, it is likely that the reeds which were used to make the Cave of the Treasure mat grew only a short time before the treasure was hidden away in its cave. Dating the mat should, therefore, provide a close estimate of when the treasure was hidden.

Now if it can be shown that the copper treasure was hidden in the cave just shortly before the Flood came, as I have pictured in my introductory historical fiction story, then the radiocarbon date of the mat should serve to radiocarbon date the Flood. What grounds are there for supposing the treasure was hidden just prior to the Flood?

Relation to the Flood

The mat and its associated treasure are unequivocally from the Chalcolithic period—all archaeologists agree on this today. I have previously proposed that the Chalcolithic period in Palestine corresponds to the pre-Flood period of the Bible.[7] In the present context it is appropriate, in support of this identification, to draw attention to Genesis 4:22. This verse, from the pre-Flood period of Biblical history, reads (NASB): "As for Zillah, she also gave birth to Tubal-cain, the forger of all implements of bronze and iron". This clearly places the origin of metallurgy in the pre-Flood period, and we have just seen above that archaeology places this origin in the Chalcolithic. Thus the mat originates pre-Flood.

We have also previously seen that the Chalcolithic period in Palestine came to a sudden termination, accompanied by the complete disappearance of its peoples.[8] Archaeologists have observed this abrupt disappearance for decades, but they have been strangely hampered in their ability to explain how an entire civilization could have suddenly vanished. For example:[9]

> And where did all the know-how, sophistication, and originality of the Chal-

[6] Gerald E. Aardsma, "The Cause of Noah's Flood," *The Biblical Chronologist* 3.5 (September/October 1997): 1–14.

[7] Gerald E. Aardsma, "Research in Progress," *The Biblical Chronologist* 1.1 (January/February 1995): 7.

[8] Gerald E. Aardsma, "Research in Progress," *The Biblical Chronologist* 1.1 (January/February 1995): 6–7.

[9] Rivka Gonen, "The Chalcolithic Period," *The Archaeology of Ancient Israel*, ed. Amnon Ben-Tor (New Haven: Yale University Press, 1992), 80.

> colithic people in so many realms of creativity go? Those who followed them seem to have started from scratch, with the exception of some basic ceramic forms. All that had been attained during the Chalcolithic period disappeared, never to return, and the following generations never reached similar achievements, not even after hundreds and thousands of years.
>
> The Chalcolithic period thus remains a mysterious period from beginning to end. If no significant breakthroughs in appreciation of its true essence are forthcoming, we will be left only to contemplate its creations, admire them, and wonder who their creators were, how they lived, in what manner they interpreted the world around them, and why they finally disappeared from the stage of human history.

The Bible supplies the "significant breakthroughs" which archaeology needs to understand this period. It informs us in the most straightforward manner possible that the Chalcolithic world disappeared because it was swept away in a great Flood—Noah's Flood.[10] In other words, the Chalcolithic was terminated by Noah's Flood.

Once this is understood it becomes clear that if the Cave of the Treasure hoard was hidden at the very end of the Chalcolithic, then it was hidden just prior to the Flood. And the evidence that the Cave of the Treasure hoard was hidden at the very end of the Chalcolithic is compelling.

First, the highly advanced technological ability in metallurgy evidenced by the treasure supports the conclusion that the copper objects originated near the end of the Chalcolithic period rather than earlier on during this period when metallurgy does appear, in fact, to have been in its infancy.

Second, the stratigraphic evidence of the cave in which the treasure was found also implies that the treasure was buried later on in the Chalcolithic. It indicates that the copper hoard was deliberately buried by digging down through the deposits of the earlier Chalcolithic. The excavator of the treasure, Pessah Bar-Adon, recorded:[11]

> There is no doubt that the treasure was hidden towards the end of the occupation of the cave in the Chalcolithic period. At that time, in order to gain access to the crevice, a pit was dug in front of it, starting from the top of the Chalcolithic deposits.

Further evidence results from efforts to answer the questions posed above: How had this hoard come to be concealed in this nearly inaccessible cave in the desert? What had the copper objects been used for? Where had they come from?

It must first be understood that such a hoard must have constituted considerable wealth in its day. It was, indeed, a treasure. Examination of the objects themselves, however, reveals no practical use for them. They would not have been functional for cooking or weaving or farming. The only rational explanation of their function which has ever been found is that they had been deliberately manufactured for use in religious ritual or as furnishings of a shrine or temple. Most of them have holes through them suggesting that they were meant to be mounted for display, on poles, for example. One was actually found with the end of the pole still in it, as noted above.

And indeed, a Chalcolithic temple, bare of all furnishings, was discovered by the archaeologists just six miles north of the Cave of the Treasure, at the En-Gedi oasis which overlooks the Dead Sea from the west. David Ussishkin of Tel Aviv University suggested, back in 1971, that here was a somewhat obvious coincidence—a temple without furnishings and a hidden hoard of temple furnishings without a temple, from the same period and located within six miles of each other. He proposed that the Cave of the Treasure hoard belonged to

[10] Unfortunately, the archaeologists are not paying much attention to the Bible anymore. They have concluded that it is myth and they have turned to "anthropological concepts" in search of explanations of their field data. They look with brooding shame at the forebears of their discipline who naively assumed the Bible had something valid to contribute to our understanding of the ancient past. If you have ever doubted that "the god of this world has blinded the minds of the unbelieving" (2 Corinthians 4:4a) then I encourage you to read a little in the technical literature of the present generation of "Biblical" archaeologists.

[11] Pessah Bar-Adon, *The Cave of the Treasure* (Jerusalem: The Israel Exploration Society, 1980), 7.

the En-Gedi temple.[12] There is no obvious reason not to accept this proposal.

Ussishkin attempted a reconstruction of the circumstances under which the treasure had been hidden. He observed that the archaeological data showed that the temple had been in use during a single, relatively brief period. It had come to its end, not as a result of deliberate destruction, but rather its ruin seemed due simply to "desertion" for some unknown reason. He noted that a similar "abandonment" of Chalcolithic sites was found everywhere in Israel, bringing that period to a close. He suggested the following reconstruction:[13]

> When the decision to abandon the temple had been reached, the "priests" methodically assembled all the ritual equipment without leaving even one article behind, and left for good. They traveled only a few miles until they reached the Nahal Mishmar [Cave of the Treasure] cave, where they stayed for a while. There they decided to continue their journey, and, considering their future return to be certain, chose to leave the ritual equipment in the cave. They carefully wrapped the articles in a straw mat and hid them in a niche never to be seen again.

This reconstruction seems to me to have a number of defects, which is why I have provided an alternate reconstruction at the introduction to this article. For example, the objects were not found "carefully wrapped" in the straw mat when excavated, nor does the evidence support the suggestion that they had been "methodically assembled". Pessah Bar-Adon described what he found thus:[14]

> Part of the artifacts were wrapped in a reed mat, measuring 0.80 × 1.20 m. Those found outside the mat probably fell out when the hoard was placed in the crevice. The artifacts were packed without any order, showing that they were hidden in a hurry.

Additionally, I cannot go along with the notion that the temple was "abandoned". Other archaeologists have used, "depopulated", to describe the end of the Chalcolithic, and what I know about the termination of the Chalcolithic from the Bible leads me to much prefer this term.

But these are details only. The important point, which both reconstructions agree on, is that the treasure was hidden away at the close of the Chalcolithic. This conclusion results from the archaeological evidence implying that the temple was in use up until it was depopulated, and the fact that depopulation appears as the signature of the close of the Chalcolithic everywhere in Israel.

The sum of the evidence, then, is that the treasure was hidden at the close of the Chalcolithic at the time of the Flood. Thus, the mat which the treasure was wrapped in should serve as an appropriate sample for radiocarbon dating the Flood.

Down to Work

After this somewhat lengthy preamble, we are ready to get down to work. We wish to use radiocarbon to date the Flood and thereby check our Biblical chronology work to the present time. *If* the mat originates at the close of the Chalcolithic (as the archaeological evidence seems to show) and *if* the Chalcolithic was terminated by the Flood (as the Biblical evidence seems to show) and *if* the proper date for the Flood is 3520±21 B.C. (as Biblical chronology seems to show) and *if* calibrated radiocarbon is a reliable dating method (as both theory and a great deal of practical experience seem to show) then the radiocarbon date of the mat should be in harmony with 3520±21 B.C. If, on the other hand, any of these things is not right, then there is no reason why the radiocarbon date of the mat should support the Biblical date.

It would be very nice, at this point, to be able to present the results of a modern radiocarbon analysis of the mat. Unfortunately, there do not appear to be any modern radiocarbon analyses of the mat. All I have been able to find are three analyses, by three independent labs, which were made about thirty-five years ago. This is not fatal to

[12] David Ussishkin, "The "Ghassulian" Temple in Ein Gedi and the Origin of the Hoard from Nahal Mishmar" *The Biblical Archaeologist* 34 (1971): 23–39.

[13] David Ussishkin, "The "Ghassulian" Temple in Ein Gedi and the Origin of the Hoard from Nahal Mishmar" *The Biblical Archaeologist* 34 (1971): 38–39.

[14] Pessah Bar-Adon, *The Cave of the Treasure* (Jerusalem: The Israel Exploration Society, 1980), 15.

the present endeavor by any means, but it is unfortunate because a great deal of progress has been made in the science and technology of radiocarbon dating since its invention by Libby back in the late 1940's. It is certain that a much more definitive result could be obtained at present than was possible thirty-five years ago. Nonetheless, the thirty-five-year-old results are adequate for the present purpose, even if they are less than ideal. What do they reveal?

The Data

The mat was first dated by Isotopes Incorporated in 1961. That lab obtained 4780±100 radiocarbon years as the radiocarbon age of the mat.[15]

Now I must make a brief comment before proceeding to the second and third radiocarbon dates on the mat. If you are current in your understanding of radiocarbon dating then you know that "radiocarbon years" are not equal to calendar years. To get a B.C. date from the mat the "radiocarbon age" of the sample must be calibrated. The calibration procedure amounts to looking up in a table the calendar year in which tree-rings having the same radiocarbon age as the sample grew. This is standard practice for all radiocarbon dates on archaeological samples today. I will apply the calibration procedure to these radiocarbon ages below.

The mat was dated a second time by the British Museum in 1963. They found 5390±150 radiocarbon years.[16]

The third radiocarbon measurement on the mat was made by the U.S. Geological Survey radiocarbon lab in 1964. They obtained 4880±250 radiocarbon years.[17]

It is immediately apparent that the first and third determinations do not agree very well with the second one. This suggests that somebody may have made an error in the second determination. This would not be too surprising—radiocarbon dating involves an intricate procedure and it is quite possible for human error to accidentally enter into this procedure at times. That is why, as I have pointed out in the past, one should not place much confidence in a lone radiocarbon date. Radiocarbon dates should always be checked. Multiple determinations of the same or related samples by independent labs, as in this case, answers the need for such a check. The strength of such checks is that it is most unlikely for independent laboratories to arrive at the same result if they have all made various errors. Here, as is usual in science, reproducibility of results is taken as the necessary evidence of their general validity.

The difference between the second date and the other two leads me to suggest that the second determination contains an error and should be discarded at this stage. Before reaching a final decision on this, however, let me check this suggestion against one other sample.

As mentioned above, the treasure also contained a piece of wood from the end of a staff which was found broken off inside one of the copper objects. We know that this piece of wood grew before the treasure was hidden, but we do not know how long before. But because wood is more durable than reeds we would expect the wood to be either older than, or of about the same age as the reeds—not younger than the reeds.

The wood sample was analyzed by Isotopes Incorporated, also in 1961. The result for this sample was 4760±120 radiocarbon years.[18] This agrees, within the stated error limits, with the first and third mat samples, but it is considerably *younger* (630 radiocarbon years) than the second mat sample. This supports the suggestion that the second mat determination contains a human blunder of some sort, and I will eliminate it from further consideration on this basis.

Results

Figure 3 shows the probability distributions which result when these two mat samples and one wood sample are calibrated.[19] Radiocarbon cannot pin

[15]Sample number I-285. Pessah Bar-Adon, *The Cave of the Treasure* (Jerusalem: The Israel Exploration Society, 1980), 199.

[16]Sample number BM-140. Pessah Bar-Adon, *The Cave of the Treasure* (Jerusalem: The Israel Exploration Society, 1980), 199.

[17]Sample number WR-1341. Pessah Bar-Adon, *The Cave of the Treasure* (Jerusalem: The Israel Exploration Society, 1980), 199.

[18]Sample number I-353. Pessah Bar-Adon, *The Cave of the Treasure* (Jerusalem: The Israel Exploration Society, 1980), 199.

[19]Calibration was carried out using the decadal dataset of CALIB 3.0.3. (M. Stuiver and P. J. Reimer, "Extended

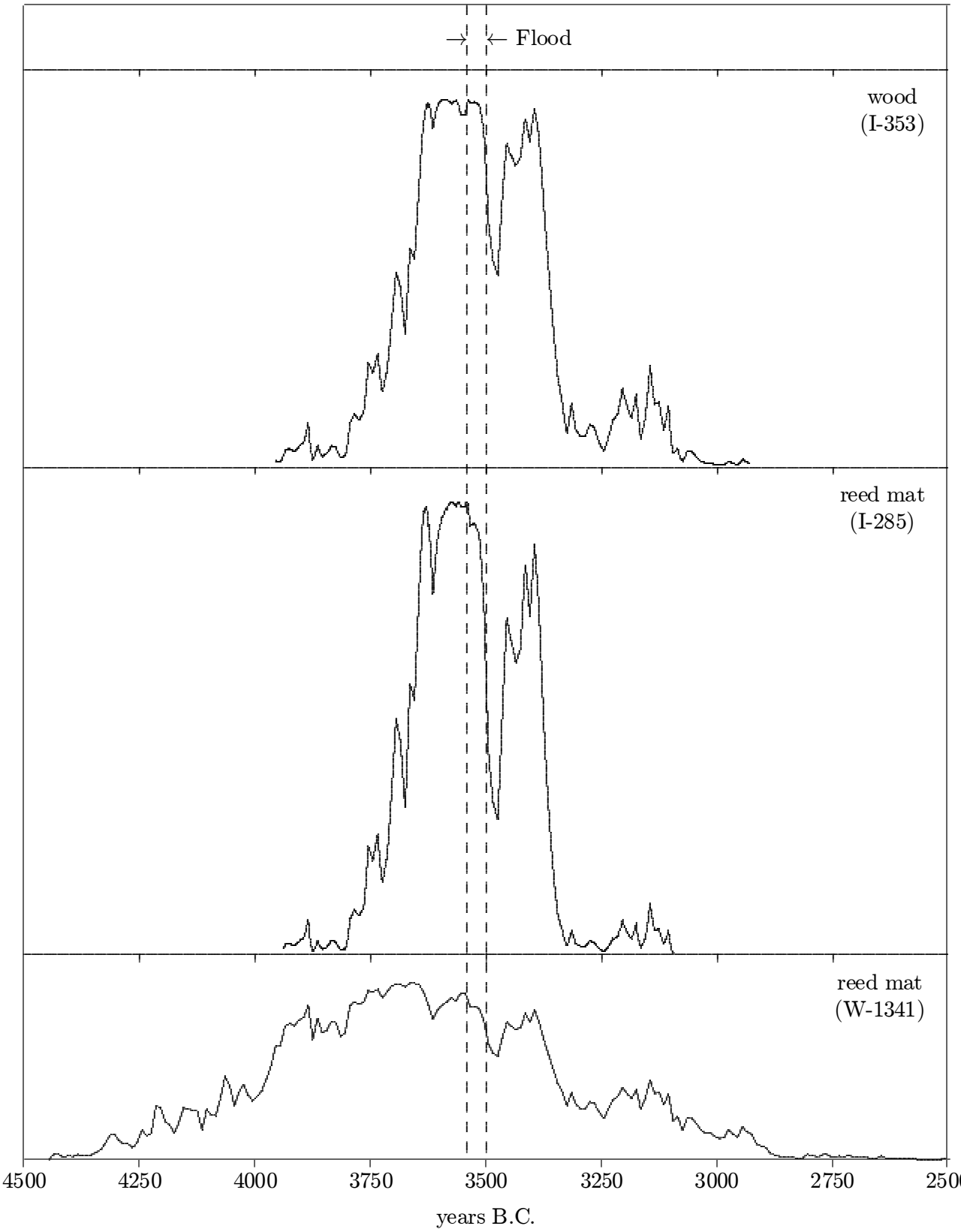

Figure 3: Probability distributions for the date of the reed mat and wood samples from the Cave of the Treasure hoard. The range of possible dates for the Flood computed via modern Biblical chronology (i.e., 3520±21 B.C.) is indicated between vertical dashed lines.

down a precise date for a sample; it can only indicate the probability the sample grew over some range of dates. The higher the probability distribution goes, the more probable it is that the sample grew at that time.

The radiocarbon results in Figure 3 imply that it is quite unlikely the Cave of the Treasure hoard was hidden any earlier than about 3750 B.C., or any later than about 3350 B.C. Said another way, radiocarbon dates the hiding of the treasure to roughly 3550±200 B.C.

An Important Technicality

Before leaving this figure I need to address one further technicality to make it clear that I have not overlooked it.

As best I can determine, none of the samples shown in the figure was adjusted for isotope fractionation. This is a subtlety which can alter a radiocarbon age by several hundred years. It can be corrected for by making suitable measurements on the sample at the time the radiocarbon measurement is made. This subtlety was only beginning to be appreciated back in the early sixties when these mat samples were measured, and the measurements necessary to correct for it were only rarely made back at that time. (Today these measurements are standard practice.)

It appears to me that the isotope fractionation affect is, in fact, small for these samples, allowing it to be legitimately ignored in the present context. To see this, note first of all that the isotope fractionation correction for wood is quite generally small (because the standard upon which the isotope fractionation correction is based is itself a wood sample). So the wood sample would very likely give essentially the same result as that which is shown for it in the figure were it to be corrected for the isotope fractionation effect.

The reeds are slightly more difficult. Berger has compiled a list of radiocarbon dates for a number of reed samples from Egypt which includes their isotope fractionation correction.[20] Two distinct groups appear in Berger's list: ones which need to be corrected by the addition of about 30 years to their radiocarbon age, and others which need to have about 230 years added to their radiocarbon age. If we were to add 230 years to the mat samples in Figure 3 the mat would then appear to be several hundred years older than the wood sample. As discussed above, it seems most unlikely that the wood sample is, in fact, several centuries *younger* than the mat. Thus I am led to conclude that the reeds used in the construction of the mat must be similar to Berger's first group, requiring little correction for isotope fractionation.

Note that the only way to entirely eliminate this uncertainty is to perform a modern radiocarbon measurement on whatever fragments of the mat still exist at the present time. I have begun to look into the feasibility of having this done because of the great significance of the date of this sample to Biblical chronology and to our understanding of the chronology and history of the earth.

Conclusions

The harmony between the radiocarbon dates of these Cave of the Treasure samples and the date of Noah's Flood which I have obtained from Biblical chronological data is immediately evident in Figure 3. This harmony is also made evident by a simple comparison of the respective dates: 3550±200 B.C. for the Cave of the Treasure hoard according to radiocarbon and 3520±21 B.C. for the Flood according to modern Biblical chronology. These two dates are indistinguishable.

This has a number of important implications.

First, and most obvious, the claim that the proper Biblical date for the Flood is 3520±21 B.C. is corroborated by radiocarbon.

Second, since this date for the Flood results from the new Biblical chronology, in which an accidentally dropped "one thousand" years are restored to 1 Kings 6:1, the new Biblical chronology is, once again, validated.

Third, the claim that the Chalcolithic in Palestine corresponds to the pre-Flood era in the Bible is substantiated.

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^{14}C database and revised CALIB radiocarbon calibration program," *Radiocarbon* 35 (1993): 215–230. The decadal dataset is by M. Stuiver and B. Becker, "High-precision calibration of the radiocarbon time scale AD 1950–6000 BC," *Radiocarbon* 35 (1993): 35–65.)

[20] R. Berger, "Ancient Egyptian Radiocarbon Chronology," *Phil. Trans. Roy. Soc. Lond. A* 269 (1970): 23–36.

Fourth, the claim that the Chalcolithic in Palestine was terminated by Noah's Flood is substantiated.

Fifth, the attack on the integrity of modern, tree-ring calibrated radiocarbon dating which is being promulgated in some Christian sectors is seen to be unwarranted. Notice that if radiocarbon dating were a capricious, unreliable methodology, three of four samples should not have given internally consistent results, as we have just seen above. Furthermore, the radiocarbon results should not have harmonized with the Biblical date in that case.

If there were some kind of conspiracy afoot to pick out only those radiocarbon results which agree with some predetermined time scale, as I have sometimes heard claimed, then why would one of the four dates, which were all reported in the same place by the same investigator, be obviously different from the other three? And how did these imaginary, black-hooded conspirators manage to pick just those radiocarbon dates which would harmonize so obviously with the new Biblical date for the Flood—which date they could not possibly have known anything about thirty-five years ago, and which event they have concluded is mythological only?

Sixth, a new era in the study of the Flood by conservative Christian scientists has opened. No longer are the date and nature of the Flood matters for speculation. Modern Biblical chronology places the Flood 3520±21 B.C., and secular chronological data from lake sediments, Arctic ice cores, and now radiocarbon all agree. Previous speculations—whether cataclysmic or tranquil, global or local—which place the Flood in history *somewhere* for certain, but *nowhere* in particular, must now give way.

Seventh and final, a new era has also opened for the secular academicians. The facts must now be faced that: 1. the Flood has been identified in secular history, and 2. its location on the time line has been secured using standard secular dating techniques. The Bible and the secular record bear unified testimony to the reality and the timing of this historical event. No longer can the informed yet unbelieving scholar rationally assert the myth that Noah's Flood is myth. ◇

Biblical Chronology 101

In the Volume 1, Number 6 issue of *The Biblical Chronologist* I summarized the "state of the subject" of Biblical Chronology at that time.[21] Substantial progress has been made on significant Biblical chronology problems in the twelve issues of *The Biblical Chronologist* which have gone to press since that summary. The early portion of the route of the Exodus has been found, pinpointing the time of the Exodus to precisely that predicted by the missing millennium thesis.[22] The traditional date of the Conquest of Jericho has been falsified by new radiocarbon results, leaving the new Biblical chronology date of that event as the only rational alternative.[23] The idea that Noah's Flood was an earth-shattering cataclysm has been shown to be incorrect,[24] while the Flood itself has been shown to have been a real event having world-wide geological impact.[25] The historical reality of the Flood has been further confirmed through study of polar ice sheets, and the date of the Flood predicted by the missing millennium thesis has been overwhelmingly confirmed by one of these ice sheets.[26] The physical cause of the Flood has been discovered,[27] and, in the current issue, harmony between radiocarbon and Biblical chronology regarding the date of the Flood has been demonstrated. Clearly, it is time to update the state of the subject.

State of the Subject

A time chart showing the current state of the subject is shown in Figure 4. I have included the time chart used in the earlier state of the subject summary as the leftmost column in Figure 4. This allows easy comparison. Once again: the "date"

[21] Gerald E. Aardsma, "Biblical Chronology 101," *The Biblical Chronologist* 1.6 (November/December 1995): 8–10.

[22] Gerald E. Aardsma, "The Route of the Exodus," *The Biblical Chronologist* 2.1 (January/February 1996): 1–9.

[23] Gerald E. Aardsma, "Wood's Jericho Tumbles," *The Biblical Chronologist* 2.3 (May/June 1996): 1–6.

[24] Gerald E. Aardsma, "Research in Progress," *The Biblical Chronologist* 2.4 (July/August 1996): 9–14.

[25] Gerald E. Aardsma, "Noah's Flood at Elk Lake," *The Biblical Chronologist* 2.6 (November/December 1996): 1–13.

[26] Gerald E. Aardsma, "Noah's Flood at Devon Island," *The Biblical Chronologist* 3.4 (July/August 1997): 1–16.

[27] Gerald E. Aardsma, "The Cause of Noah's Flood," *The Biblical Chronologist* 3.5 (September/October 1997): 1–14.

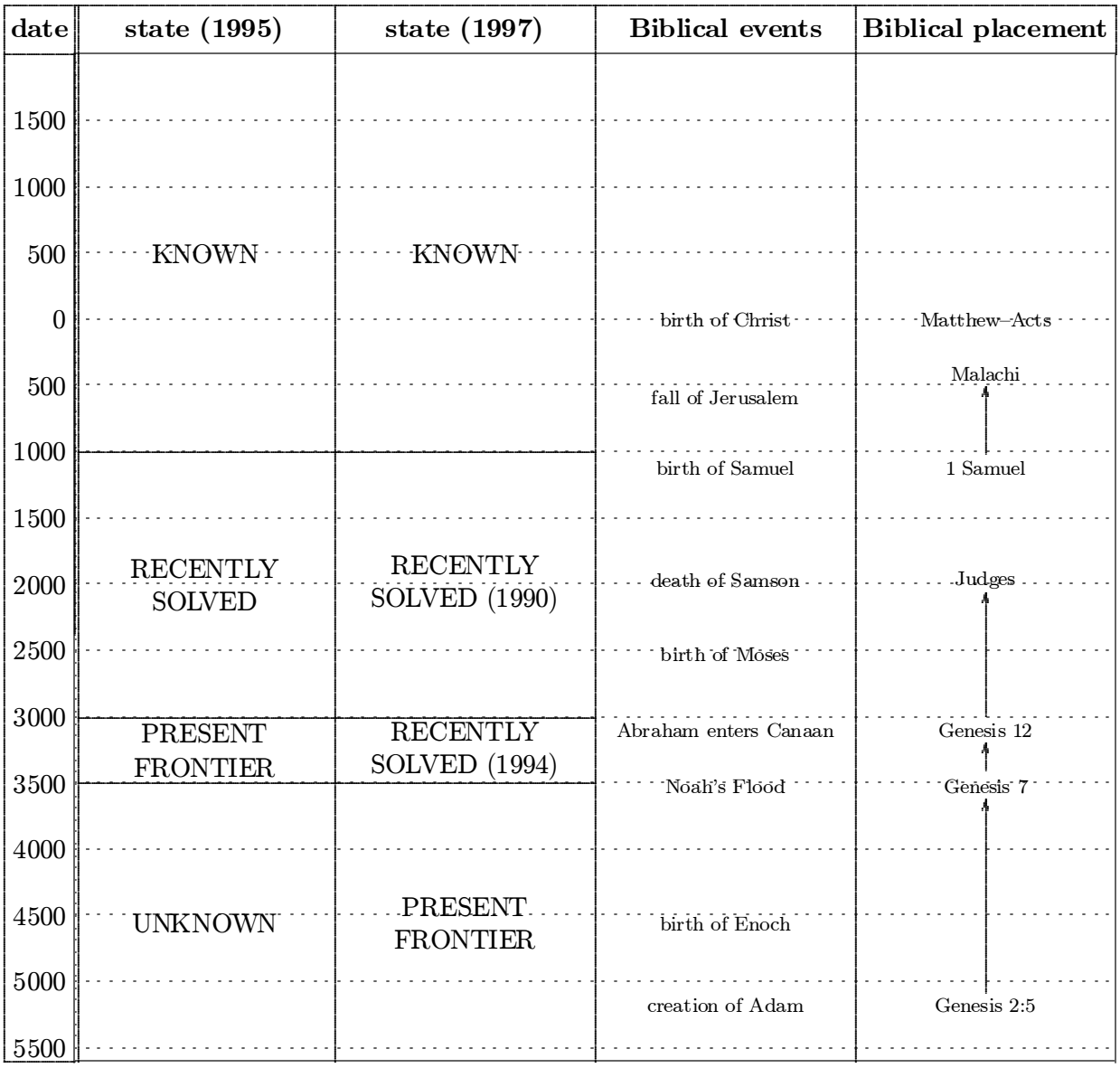

Figure 4: The state of the field of Biblical chronology at present.

column on the left is purposely given in increments of 500 years; boundary lines between regions in the "state" columns are deliberately rounded to the nearest 500 years for the sake of simplicity; and regions are depicted as sharply bounded whereas there is some degree of gradation between them in actual practice.

Known

The "KNOWN" region remains unchanged. By "KNOWN" I mean to imply that there is basic harmony between Biblical and secular chronology in this period, and also that reasonably accurate chronological information regarding this period is readily available in textbooks and standard reference works.

This region extends back from the present through Solomon, David, Saul, and Samuel. A tiny minority of academicians are currently trying very hard to demonstrate that the Biblical accounts of Solomon and David are mere fiction. They are, of course, being given high visibility in the liberal media.[28] But they have yet to show any evidence which disturbs the basically "KNOWN" character of this period in any way.

[28] See for example *Biblical Archaeology Review* 23.4 (July/August 1997): 26–42, 66.

Recently Solved (1990)

The period from 1000 B.C. to 3000 B.C. reaches back into the time of Abraham. It includes the monumental events of the Exodus of the children of Israel from Egypt and the Conquest of Canaan. This period was solved by the discovery, seven years ago, that 1000 years are missing from the current text of 1 Kings 6:1.[29] Decades of confusion regarding the proper historical and archaeological settings of the Judges, Conquest, Exodus, and Patriarchs was immediately clarified by the discovery of this missing thousand years. The proper Biblical dates of these events—1000 years earlier than traditional Biblical chronology had assumed—have now been repeatedly confirmed using data from the field of Biblical archaeology.

The validity of the missing millennium thesis and the basic soundness of the Biblical chronology of this period which results from it are now beyond rational dispute. Unfortunately, few Bible scholars are even aware of this important chronological discovery and its happy implications for Biblical historicity.

Much work remains to be done in this period. While the ready harmonization of Biblical and archaeological data in this interval has been amply demonstrated, very many details yet remain to be investigated and harmonized. As a single example, the proper archaeological identification of the store cities, Pithom and Raamses, which the Israelites built during their enslavement in Egypt (Exodus 1:11) has yet to be seriously researched and clarified within this new chronological framework.

Recently Solved (1994)

This period takes us back into the life of Noah and contains the Flood as its most significant event for chronological purposes. While it was the "PRESENT FRONTIER" back at the end of 1995, it must now be regarded as solved. In particular, the date of the Flood has now been corroborated in a sufficient number of independent ways to leave the proper chronology of this period beyond rational dispute.

Strictly speaking, this period was solved with the discovery of the missing millennium in 1 Kings 6:1 back in 1990. It took four years for this to be realized, however, and for the thesis to be formulated that the new Biblical chronology (which restores 1000 years to 1 Kings 6:1) was already in essential agreement with secular chronology—that no further correction of traditional Biblical chronology was required. The major impediment to progress, besides the workload associated with the investigation of the new Biblical chronology in the more recent period, was conceptual. Specifically, having been led to conceive of the Flood as something quite different from what it actually was, it was difficult to know even how to look for the real, historical Flood within the secular data. It was four frustrating years before the simplicity of the truth finally dawned.

Accompanying the investigation of the chronology of this period over the past several years has been a growing awareness of the true nature of Noah's Flood. This has, most recently, culminated in the pulling of the physical phenomena underlying the Flood from a vague region of blissful ignorance, guess, and fantasy into something science and the human mind can intelligently deal with. While this process of discovery has been accompanied by a certain sadness at the loss of traditional mystique, it has also occasioned great rejoicing because of the demonstration of the solid reality of the Flood which it affords in the face of current, rampant unbelief.

Present Frontier

The "PRESENT FRONTIER" of Biblical chronology research has now moved into the pre-Flood period. This takes us back to the creation of Adam and ultimately to the Creation of the physical universe. This has been a region of great difficulty and confusion for Biblical chronology in recent centuries. Here, for example, lies the "age of the cosmos" problem, with its dependent "young-earth versus old-earth" and "creation versus evolution" debates.

The thesis which will be guiding my immediate investigation of this period results from the experience gained in unifying the Biblical and secular chronological data pertinent to the Flood. Specifi-

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

cally, I will be assuming that no further adjustment to traditional Biblical chronology is needed beyond the restoration of 1000 years to 1 Kings 6:1. I will then be comparing the Biblical history of this period with secular history using established secular chronologies and dating techniques.

In some ways the task of unifying Biblical and secular chronologies for this period seems formidable. But I am encouraged by two considerations. First is the fact that the unification of Biblical and secular data bearing upon the Flood seemed an equally formidable task just a few short years ago, but now that problem is solved. Second is God's evident blessing on the work to the present time. ◇

Research in Progress

There are many available avenues for research at the present time. I am finding it necessary to skip over some things I would very much like to delve into. The present report gives one such example.

In Volume 3, Number 3 of *The Biblical Chronologist* I used the Genesis narrative of the Flood to produce a graph of the depth of the Flood versus time. (That graph is reproduced here as Figure 5.) There I noted:[30]

> It would be very nice if a theoretical functional form could be fit to these data points. Unfortunately, our present ignorance of the mechanism of the Flood leaves us without the necessary physical basis for such an attempt.

This limitation was removed with the publication of the hemispherical Flood model last issue. It is now possible to explain why this graph looks the way it does, and this is the purpose of the present report. While it is possible in principle to do this quantitatively and fairly rigorously via computer modeling, a very large investment of time would be required for me to do so. Hence the following discussion is largely qualitative. It is intended to provide some additional insight into how the Flood behaved and why it behaved the way it did.

[30] Gerald E. Aardsma, "The Depth of Noah's Flood," *The Biblical Chronologist* 3.3 (May/June 1997): 6.

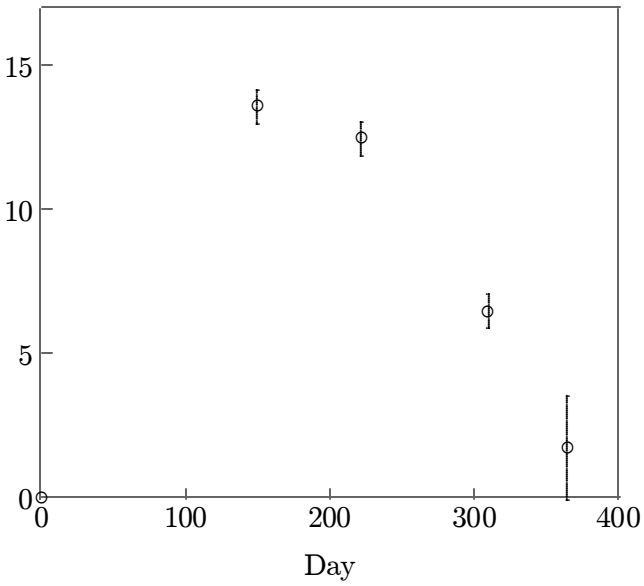

Figure 5: Depth of the water of the Flood in the Ararat region, in thousands of feet, versus time. Error bars are $\pm 3\sigma$.

Dynamics of the Inner Core of the Earth at the Time of the Flood

We now know that the fundamental mechanism controlling the depth of the water during the Flood was the displacement of the inner core of the earth.[31] We have seen that there is a direct relationship between the displacement of the inner core from the center of the earth and the depth of the water at any point on the surface of the earth (provided only that the water is given sufficient time to come to its equilibrium configuration).[32]

Figure 6 shows, for example, the equilibrium configuration of the water of the oceans in the two extreme cases of 1. a centered, and 2. a maximally displaced inner core. The left diagram in this figure shows the state of the earth and the oceans before the Flood began and after it was all over. The diagram on the right shows the state of the earth and oceans at the height of the Flood—on Day 150 of the Flood, for example.

I would now like to use this physical mechanism of the Flood to fill in and explain Figure 5.

The first question which must be asked is, "How

[31] Gerald E. Aardsma, "The Cause of Noah's Flood," *The Biblical Chronologist* 3.5 (September/October 1997): 1–14.

[32] Gerald E. Aardsma, "The Cause of Noah's Flood," *The Biblical Chronologist* 3.5 (September/October 1997): Figure 2, page 11.

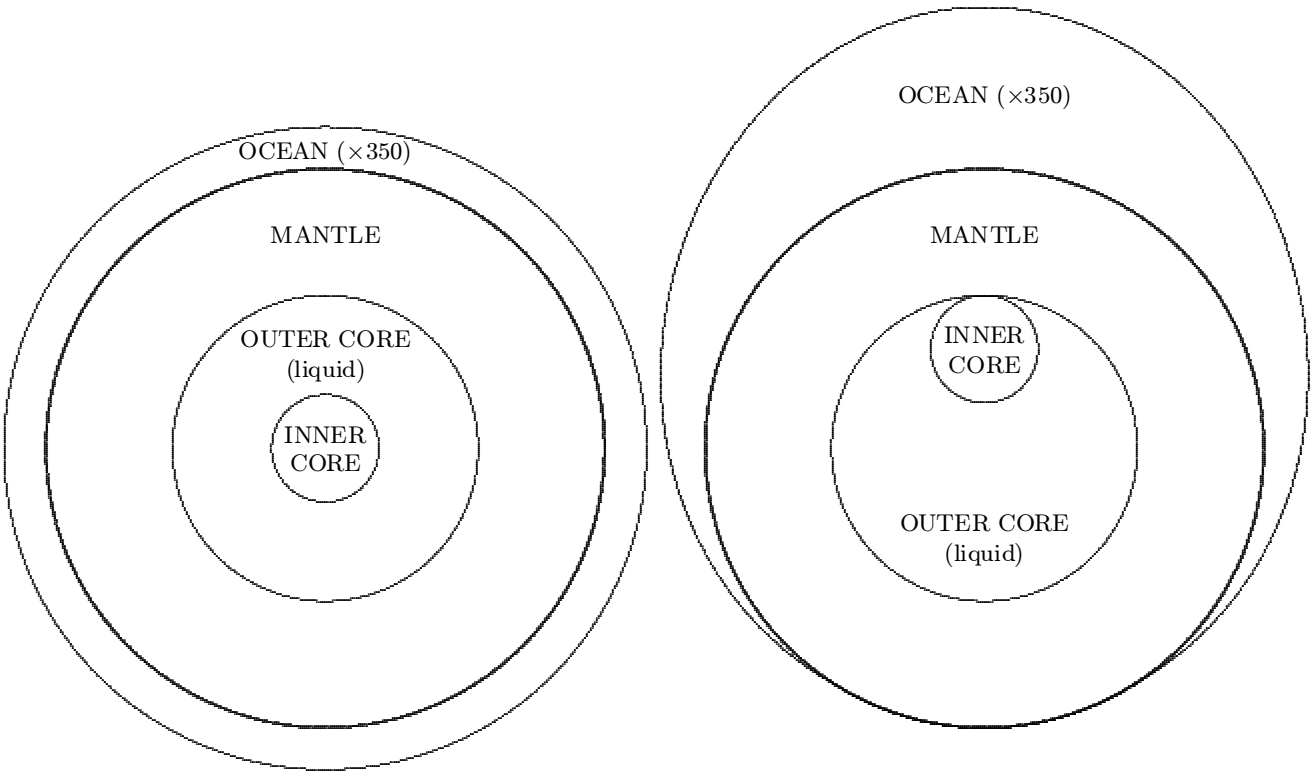

Figure 6: Scale cross-section of spherical earth under normal conditions (left) and at the height of the Flood (right). The heavy line is a scale representation of a 30 km thick crust. The depth of the ocean has been magnified 350 times relative to scale in both diagrams. The unequal distribution of continental volume in northern and southern hemispheres has been taken into account in the distribution of the ocean water.

long did it take for the inner core to reach maximum displacement?" Last issue I found an initial speed of the inner core after the impact of the space rock of 1.2 kilometers per second. As the inner core climbed against gravity toward the mantle its speed would have reduced. To determine an approximate length of time for the inner core to have reached the mantle, assume the average speed of the inner core was one half its initial speed. The distance it needed to travel was 2,250 kilometers. These numbers yield a characteristic time of just one hour.

If we assume that the fluid outer core also participated in the motion (as seems likely) then the initial speed of the inner core may have been slower. I find a characteristic time of about five hours in that case. In either case it is clear that the inner core reached maximum displacement very quickly relative to the overall duration of the Flood.

This means that the water of the oceans was experiencing the maximum possible gravitational attraction toward the impact center due to displacement of the inner core within just a few hours of the space rock impact. It does *not* mean that the water reached maximum depth in that time, however. The reason for this is that the water would have to flow from the southern to the northern hemisphere, and it takes time for water to flow from one place to another.

How long would it likely take the water to reach maximum depth? We can obtain a rough answer here as follows. First, note that each piece of water in the southern hemisphere would need to flow roughly one quarter of the way around the globe to get to its new location in the northern hemisphere. This is a distance of roughly 10,000 kilometers. Ocean currents are observed to flow as fast as 200 kilometers/day at the present time.[33] These numbers yield a characteristic time of 50 days.

[33] George L. Pickard and William J. Emery, *Descriptive Physical Oceanography: an Introduction*, 4th (SI) enlarged edition (New York: Pergamon Press, 1982), 80.

This resonates immediately with the record in Genesis 7:17a that "the flood came upon the earth for forty days". It may be, in fact, that the water took forty days to come to its maximum depth and that it is this fact which Genesis 7:17a intends to convey.

In any event, once the water had reached its maximum depth it stayed there until Day 150. This implies that the inner core of the earth was kept in contact with the mantle for on the order of 150 days. This seems clearly to imply that the fluid outer core had been set in motion by the rising of the inner core and that its motion exerted a force on the inner core to hold it in place against the mantle.

The fluid of the outer core is believed to have a viscosity about one tenth that of water, so currents established within it could persist for a very long time. The idea of a strongly rising current up the center with more slowly falling currents along the core/mantle boundary suggests itself from the geometry. In that case the inner core would have been supported on the rising plume of core fluid.

This situation persisted until Day 150 when the inner core began to descend toward the center of the earth once again. Its descent would have been an inevitable consequence of the slowing of the fluid currents due to friction. As they slowed the drag force they exerted on the inner core would have diminished, allowing gravitational attraction to move the inner core back toward the center.

I previously observed that:[34]

> it seems clear that the rate of recession of the water accelerated with time following attainment of maximum depth. Notice that the rate of recession was more rapid from Day 222 to Day 310 than it was from Day 150 to Day 222.

This can be explained by the inner core gaining speed initially as it fell. This is probably due to increased turbulence within the fluid, resulting from flow of the fluid entirely around the inner core once it had moved away from the mantle. Turbulence would dissipate energy and reduce the speed of the plume supporting the inner core.

Finally, it should be noted that it appears the inner core would not have overshot center. The descent of the inner core appears to have been governed at all points by a balance between the drag force of the fluid plume upward and the force of gravity downward. The inner core would have reached the center only as the drag force of the plume fell to zero. At that point there would have been no force or inertia to move the inner core further down. This means that no flooding of the southern hemisphere would occur as the Flood waned in the northern hemisphere, and no second pulse of flooding would occur in the northern hemisphere. The Flood would have decayed away monotonically.

Result

Notice that the behavior of the inner core breaks naturally into three regions following the impact of the space rock. First is a rapid rise (one to five hours) to the mantle. This is followed by 150 days of being pinned to the mantle by fluid core currents. This is then followed by a final descent back to the center of the earth lasting approximately 250 days.

The Flood itself also divides naturally into three physical stages, as shown in Figure 7. First is the waxing of the Flood, lasting probably forty days. It is due to the time required for the water from the southern oceans to flow into the northern hemisphere. Second is a period during which maximum depth was maintained, lasting on the order of 100 days. It is due to the inner core being pinned against the mantle. Third is the waning of the Flood, lasting roughly 250 days, due to the slow descent of the inner core back to the center of the earth.

While all of this needs to be checked by quantitative computer modeling, it is apparent that the depth and timing of the Flood can be explained, at least in principle, by the hemispherical Flood model.

In closing let me note that while the foregoing discussion has focused on the role of the oceans in bringing about the Flood, the Biblical account is clear that there was also a great deal of rain at the time of the Flood. In this regard, notice that the atmosphere is held in place by gravity just as the

[34] Gerald E. Aardsma, "The Depth of Noah's Flood," *The Biblical Chronologist* 3.3 (May/June 1997): 6.

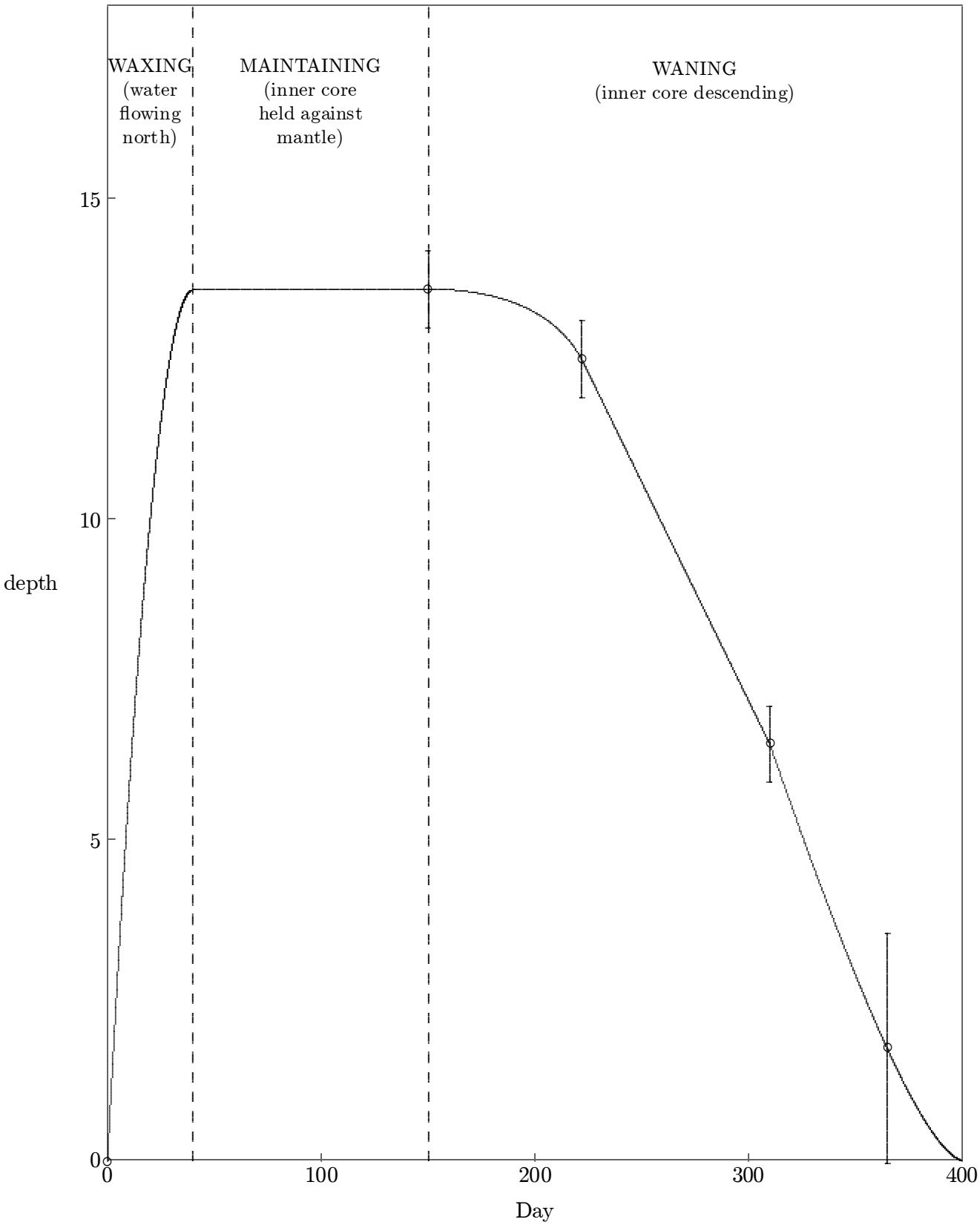

Figure 7: The stages of the Flood explained. (The solid line through the data points is heuristic only.)

oceans are. Thus its shape would have changed at the time of the Flood just as the shape of the oceans did. Great winds would necessarily have resulted as the entire atmosphere shifted northward at the beginning of the Flood, and then southward again as the Flood waned. When coupled with the atmospheric and hydrologic disturbances which were no doubt created immediately upon impact of the space rock, there is clearly plenty of room for the rain and wind of the Genesis account within the hemispherical Flood model. This, too, is in need of rigorous computer modeling, however, before definitive cause and effect relationships can be established. This is another area in which such studies promise to greatly enrich our comprehension of the nature of the Flood. ◇

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.