

The Biblical Chronologist

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

(Ecclesiastes 7:24)

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Zoogeography and Noah's Flood

Note to readers: I am concerned that readers who feel the Bible demands that the waters of Noah's Flood covered the entire earth may find the following article a little frustrating. It explores the relationship between the scientific field of zoogeography and the Biblical historical event known as Noah's Flood, working within the framework of a new scientific model of Noah's Flood called the hemispherical Flood model. This model specifies that the waters of Noah's Flood covered one hemisphere of the globe only. The following article concentrates on the scientific evidences and issues alone—it appears oblivious of the Biblical issues involved. This may be frustrating to readers who feel that the Biblical evidence is definitive and that it overrides all other considerations.

As I do not wish to frustrate any reader or slight their Biblical perspective in any way, I urge any who may feel this way to please read the "Readers Write" column this issue before undertaking the following article. Contrary to the appearance of this article, I am well aware of, and well versed in the Biblical issues involved. In the "Readers Write" column I deal with the Biblical issues openly, frankly, and at some length.

Several issues ago I introduced the hemispherical Flood model.¹ This model pictures Noah's Flood as the natural outcome of a highly improbable collision of a high-speed cosmic projectile (i.e., a rock from outer space) with the earth. One consequence of this collision was ocean-deep flooding of much of the northern hemisphere of the earth for the better part of a year. This is the flooding which Noah experienced, and which is recorded in Genesis.

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

Global Versus Hemispherical

When I introduced this model I pointed out that it immediately resolves the problem of why Australia should have such an odd and oddly assorted animal population relative to the rest of the globe.² Australia has, for example, a great predominance of marsupial mammals. (Marsupials are animals which rear their young in pouches, such as the kangaroo.) This is in sharp contrast to other large land masses of the world whose mammal populations are predominantly placentals. This observation generates a difficult problem if one supposes the entire globe was flooded by Noah's Flood. How did so many different types of marsupials manage to wind up in Australia after the Flood, while the placentals, which are so populous elsewhere, were excluded?

As a single case in point, consider the koalas. These Australian marsupials are slow-moving, defenseless, and almost completely arboreal.³ They feed exclusively on the leaves and buds of the eucalyptus tree. On the assumption of a global Flood, how did the koalas make the journey after the Flood from the ark in Turkey to Australia? Since eucalyptus trees are not native to Asia, what did the koalas eat on this long journey? How did they protect themselves from the carnivorous placentals of Asia? How did they cross the ocean between Asia and Australia? And how did they manage such a trip while placental squirrels and monkeys, for example, which also live in trees and do not suffer the severe limitations of speed, defense, and diet of the koalas, were entirely unable to reach that subcontinent after the Flood?

Australia is just one region of the globe pos-

²Gerald E. Aardsma, "The Cause of Noah's Flood," *The Biblical Chronologist* 3.5 (September/October 1997): 5–6.

³James H. McGregor, "Koala," *The Encyclopedia Americana*, vol. 16 (Chicago: Rand McNally, 1962) 502.

ing difficulties for a global Flood model. Central and South America constitute another such region. This region holds a monopoly on the native world population of sloths, for example. Two distinct groups of sloths are found there—three-toed and two-toed—with species and subspecies. But no sloths of any sort are found anywhere else in the world. How did *all* the sloths wind up in Central and South America? And how did these creatures, which “are strictly arboreal and do not live outside forest areas” survive the long journey from the Ararat region to South America in a world which had just been denuded of all its forests by a global Flood? Note that these sloths “move at an average speed of 14 feet a minute [about one mile in 6.3 hours] on the ground” and they “sleep 18 out of 24 hours”.⁴ It takes a long time to travel from the Ararat region to South America (a journey of some 10,000 miles by way of Bering Strait) at a speed of one mile a day!

In the hemispherical Flood model these difficulties do not arise. According to the hemispherical Flood model flooding was largely confined to the northern hemisphere of the globe. Australia was not flooded and neither was South America. Their unique faunas had no need to seek shelter in the ark, and no need to make the long journey home from Ararat. They were preserved in their native habitats.

The science of mapping out regions having distinct faunas is known as zoogeography. The purpose of the present article is to show that the hemispherical Flood model, rather than encountering difficulties with zoogeography, offers a simple explanation of some of the most basic observations of that science.

Before we enter into this, however, please note that I can only address this subject as a non-expert. Zoogeography is somewhat far removed from my native discipline of physics and my lifelong specialization in chronology. Fortunately, the present article does not require expert ability. It is not meant to be the final word on zoogeography and the Flood, by any means. It is intended as a beginning only. It appears that, with the introduction of the hemispherical Flood model, we who are conservative Christians have an opportu-

nity for the first time to begin to bring about an intelligible unification of zoogeography and Biblical history. This brief article is intended only as an introduction to this new opportunity. My hope is that it will encourage others who are qualified in the life sciences to pursue this new opportunity to the glory of God.

Fundamental Premise

The fundamental premise involved in unifying zoogeography and the Flood is that the regions of the globe which were flooded by Noah’s Flood were suddenly and simultaneously wiped clean of air-breathing, land-dwelling animals roughly 5500 years ago, while native faunas were not thus exterminated in non-flooded regions.

Please note that I have tried to word this fundamental premise carefully. It is not correct to suppose that life in non-flooded regions was unaffected by the Flood. It seems certain that life was severely stressed *globally* by the Flood. For example, the atmosphere would have moved to the north just as the water did, since it, too, obeys the law of gravity. This would have rarefied the air in the south, similar to what is experienced only at high altitudes at present. There is every reason to suppose that the climate would have been dramatically altered globally during the Flood, and much reason to suppose that food chains would have been dramatically disrupted globally. The main distinction between flooded and non-flooded regions is that extermination was *certain* in the flooded regions, while there was at least some chance of survival in non-flooded regions.

This fundamental premise implies that present-day animal populations in regions of the globe which were flooded have their origin post-Flood, while those in regions which were not flooded have their origin pre-Flood. Flooded and non-flooded regions of the globe are thus expected to be distinguishable zoogeographically.

The Zoogeographical Regions

Figure 1 shows the zoogeographical regions according to Sclater and Wallace. While these regions are separated by solid lines in the figure it is important to note that “it is impossible in most cases to draw any very clearly marked boundary line between one

⁴Harold E. Anthony, “Sloth,” *The Encyclopedia Americana*, vol. 25 (Chicago: Rand McNally, 1962) 100.

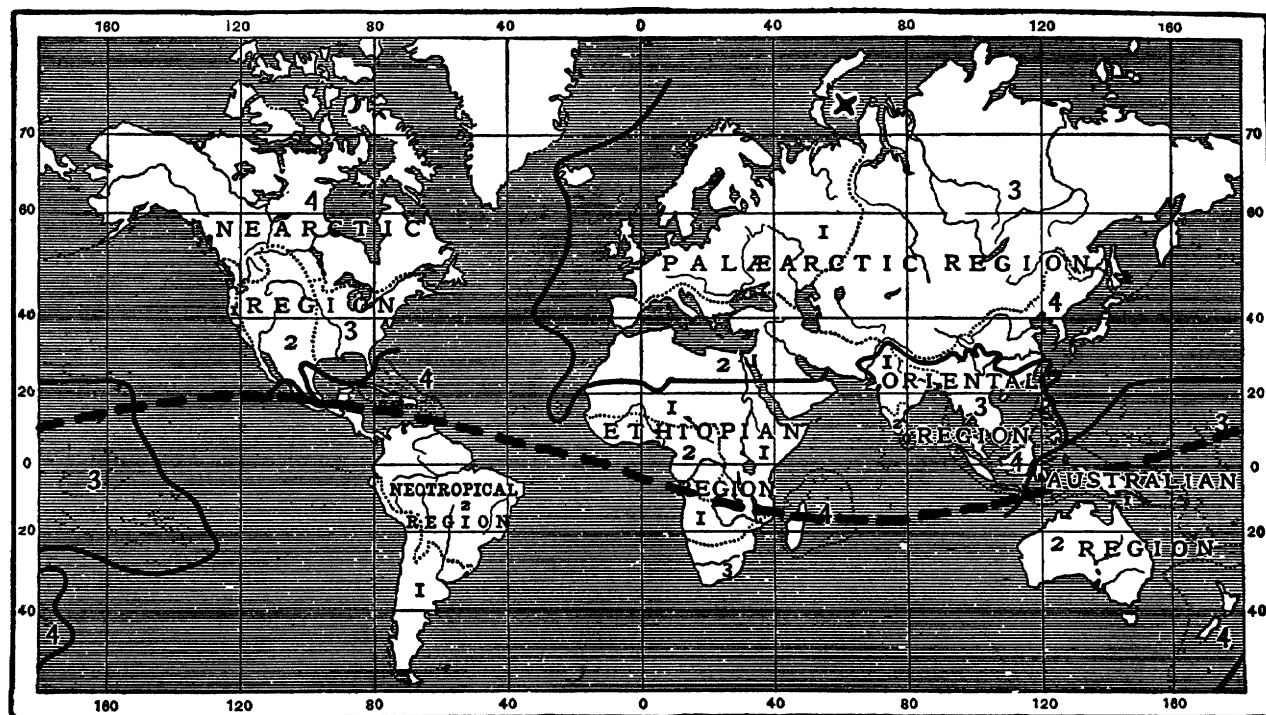


Figure 1: Flood line (dashed) relative to the zoogeographical regions according to Sclater and Wallace. The × marks the proposed location of the impact center. [Zoogeographical map is from Ernest Ingersoll, "Zoogeography," *The Encyclopedia Americana*, vol. 29 (Chicago: Rand McNally, 1962) 727.]

region and another".⁵ In other words, distinct animal distributions tend to diffuse together at their boundaries, rather than being sharply separated.

The Limits of the Flood

To compare these zoogeographical boundaries to the Flood, we must determine which regions were flooded and which were not. To map the boundaries of the flooded area in detail is a very involved process with many subtleties. For the present purpose a detailed picture is not required however, so I will skip over all of these subtleties and paint the geographical limits of the Flood with a bold, broad brush. The result should be considered as a good, first-order approximation to the actual, real-life boundary.

The Flood depth curves of Figure 2 in Volume 3, Number 5 of *The Biblical Chronologist* provide the basic data required for this purpose. The most important pieces of information from this figure for the present study are: 1. the depth of the

Flood was symmetric over the surface of the earth about the impact center, where the Flood was deepest, and 2. flooding extended nearly quarter way (about 88°) around the globe in all directions from the impact center.⁶

I have chosen the Kara Sea, on the northern coast of Asia (61°E, 72°N), as the impact center of the cosmic projectile for the present painting job. I have previously advanced this possibility on the

⁶The extent of flooding of interest to the present study involves flooding which was deep enough to exterminate life. (This is one of the subtleties involved in mapping the geographical limits of the Flood.) The 88° figure is for flooding to *any* depth at all above mean sea level today. Thus this 88° figure may appear open to criticism as being altogether too generous—life exterminating depths for most land masses appear on the Flood depth curves to extend to only about 60°. However, the most recent research has indicated that the Flood depth was probably much greater in the 60–90° range during the opening hours of the Flood when the waters were on the move than it appears in the (static) Flood depth curves, which only apply once the waters had reached their new equilibrium position. (See the "Research in Progress" column this issue for more on this.) Thus 88° does, in fact, presently appear as a better estimate of the life-exterminating extent of the Flood than 60°. Indeed, even 88° is probably a slight underestimate.

⁵Ernest Ingersoll, "Zoogeography," *The Encyclopedia Americana*, vol. 29 (Chicago: Rand McNally, 1962) 727.

basis that the Kara Sea is the only obvious crater-shaped formation in the narrow region where the impact center is expected.⁷ While this choice cannot be guaranteed correct at this point, there is no other candidate evident, and a slight inaccuracy here will not significantly alter the present broad-brush results in any event.

The dashed line on Figure 1 corresponds to a circle drawn 88° from the center of the Kara Sea all around the globe. It is my broad-brush line separating regions of the globe which were flooded (to the north of it) from regions which were not flooded (to the south of it). I will call it simply the "Flood line".

Comparison

The question to be answered is, "Can the zoogeographical regions shown in Figure 1 be reasonably explained in broad outline given this Flood line?" The answer appears to be a fairly solid yes.

To appreciate this, some awareness of basic zoogeographical principles is required. The most important principle for the present study is that populated regions represent an "organic barrier", inhibiting any influx of newcomers from the outside.⁸ Thus diffusion of animal populations can only occur from populated regions into depopulated regions.

This principle is quite important to everything which follows. Note that it predicts that we should expect diffusion of fauna from south of the Flood line into the unpopulated north after the Flood, but not from the north (even after it had repopulated) into the south, because the south would already have been populated. Examples of this are seen repeatedly in Figure 1.

Basic boundaries

As a first example, consider the Australian region. Notice, in Figure 1, how it extends to numerous small islands north of the Flood line in the mid-Pacific. These islands would all have been washed clean of life at the time of the Flood and subsequently repopulated by diffusion of life forms from

the portion of the Australian region which had not been flooded, south of the Flood line.

Next consider the Palaearctic region in Figure 1. It is expected to have been repopulated by the animal types which Noah preserved alive aboard the ark because it includes the Ararat region in which the ark came to rest and from which these animals would have diffused outward generation by generation.

Notice that the Palaearctic region nowhere extends south of the Flood line. If the boundary between the Palaearctic and the Australian regions had swung 20° to the south of the Flood line instead of 20° to the north of it, for example, the hemispherical Flood model would have encountered a grave difficulty. This would have meant that animal populations from the ark had somehow diffused into the already populated regions south of the Flood line, and that would have been a violation of the "organic barrier" principle. But the boundary is consistently north of the Flood line, never south.

Consider next the boundary between the Oriental and Australian regions. The geographical area of interest here is shown in greater detail in Figure 2. Different shades of grey are used to distinguish the two zoogeographical regions in this figure. Notice the extension of the Australian region north of the Flood line once again.

The boundary between the Oriental and Australian regions can be explained as follows. During the Flood animal life north of the Flood line was exterminated, while animal life south of the line was not. After the Flood the islands north of the line were open for repopulation. This was accomplished via diffusion from the Oriental region of mainland Asia to the northwest (I discuss the origin of the mainland Oriental population below), and diffusion from the Australian region to the southeast.

Where diffusion from one region was more rapid than the other (because of proximity, or favorable ocean currents, for example), repopulation with that region's fauna resulted. Thus, for example, repopulation of northern New Guinea with Australian animal types from the large portion of New Guinea which was not flooded was assured. Similarly, repopulation of Sumatra by Oriental fauna was virtually assured by its proximity to the Malay

⁷Gerald E. Aardsma, "The Cause of Noah's Flood," *The Biblical Chronologist* 3.5 (September/October 1997): 12-13.

⁸Ernest Ingersoll, "Zoogeography," *The Encyclopedia Americana*, vol. 29 (Chicago: Rand McNally, 1962) 726.

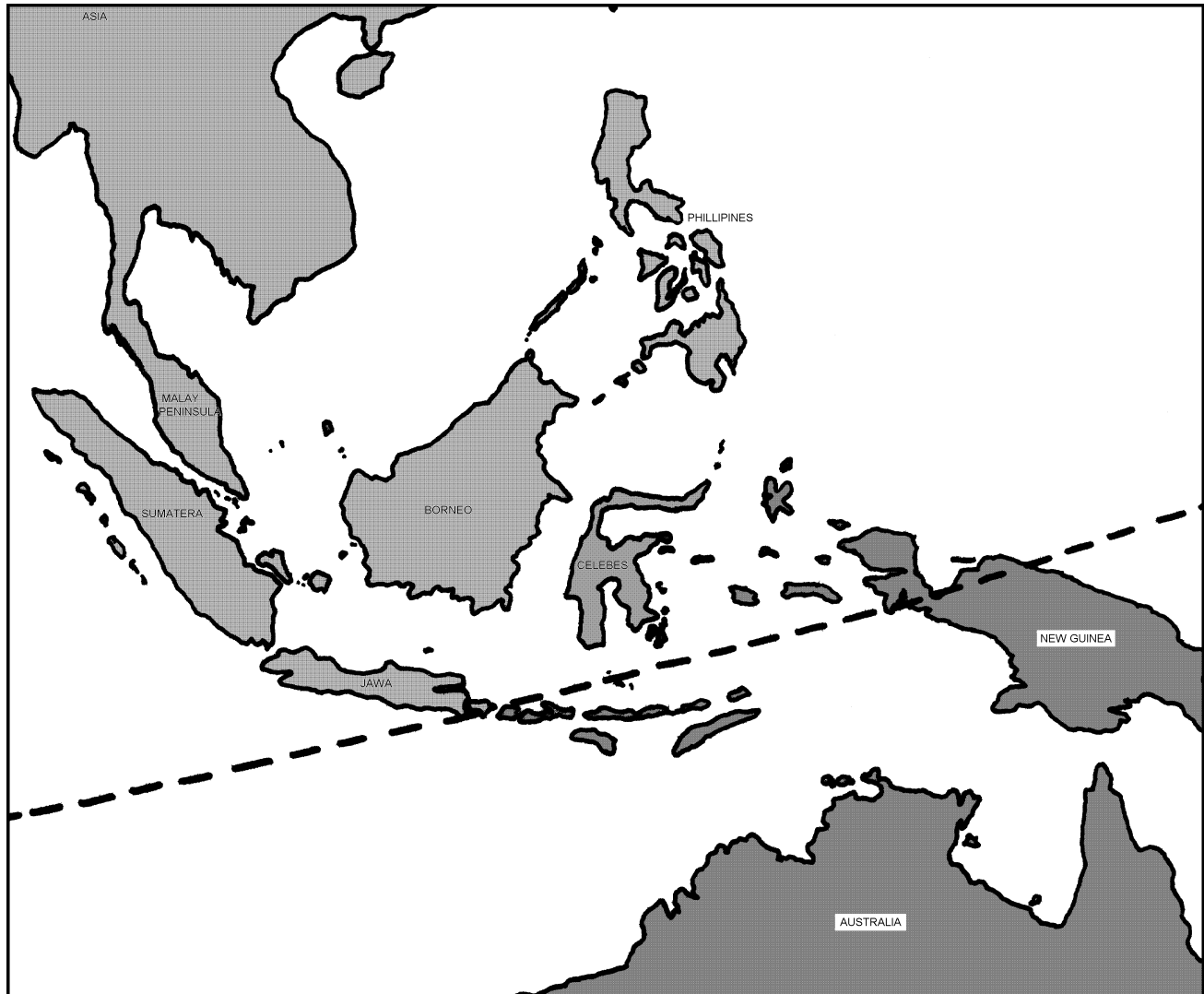


Figure 2: Flood line (dashed) in area of the earth where the Oriental and Australian zoogeographical regions meet. Lands whose fauna are classified as Oriental are shaded lightly. Lands whose fauna are classified as Australian are shaded darkly. Celebes, whose fauna is intermediate, is shaded medium.

peninsula.

But wherever diffusion times from the two regions were equal, a mixed population resulted. The principle example in this category is Celebes. Ernest Ingersoll notes: "Celebes might be referred almost with equal right to this [the Australian] or the previous [Oriental] region".

The principle of diffusion into unpopulated areas also explains the Ethiopian region. This region (Figure 1) straddles the Flood line. It is evident that native African pre-Flood fauna must have been preserved in the Ethiopian region south of the Flood line. The present distribution of Ethiopian

fauna can be explained by its diffusion northward after the Flood. The extent of its northward diffusion may have been determined by the encounter of a different fauna diffusing southward from the Palaearctic region, or it may have been due to the climate barrier presented by the deserts of northern Africa.

The Neotropical region is also obviously explicable in terms of survival of native American faunas south of the Flood line, with some diffusion northward after the Flood.

The Nearctic region was obviously depopulated by the Flood. In principle it could have been re-

populated by diffusion from the south (i.e., from the Neotropical region) or by diffusion from the Palaearctic region across the narrow Bering Strait. Since these are the only two possibilities, the hemispherical Flood model predicts that the fauna of the Nearctic region should be similar to either the Neotropical or the Palaearctic regions.

In point of fact there is a pronounced similarity with the Palaearctic region. The similarity is sufficiently great for some zoogeographers to “advocate the union of the Nearctic and Palaearctic regions under the name of Holarctic”.⁹ Thus it is clear that Bering Strait was the principle avenue for repopulation of North America following the Flood.

Why the Bering Strait route was favored over the Mexico route is an interesting question. It is tempting to suggest that the deserts of northern Mexico may have been an effective barrier to repopulation from the south. But I sense that I am out of my depth here and perhaps there is some other explanation.

In any event, it is clear that the basic regions and boundaries of Figure 1 can be explained in a simple, natural way within the hemispherical Flood model framework.

Lack of variety in the north

Zoogeography seems to bear witness to the validity of the hemispherical Flood model in another way as well. This comes about through a comparison of the variance in animal forms north and south of the Flood line. Specifically, the lack of variety within the fauna of the northern flooded regions contrasts sharply with the variety which characterizes the southern regions which were not flooded.

Notice, to begin with, that there are three distinct zoogeographical regions in the south (i.e., Neotropical, Ethiopian, and Australian) and only two in the north (i.e., Holarctic and Oriental). But more striking is the variation within regions south of the Flood line relative to the north. For example, the fauna of New Zealand are sufficiently distinct from that of Australia for New Zealand to be grouped as a separate sub-region unto itself. But even this obscures the diversity which exists be-

tween Australian and New Zealand fauna. Ingersoll notes that “New Zealand is treated by Wallace as a *highly peculiar* sub-region of this great [Australian] region” [my emphasis].¹⁰

There seems to be a great deal more regional variation in animal forms to the south of the Flood line than there is to the north of it. This is to be expected. A basic prediction of the hemispherical Flood model is that the Flood reduced all regional variation north of the Flood line to zero at the time of the Flood. The north was then repopulated from a single basic stock which had been preserved aboard the ark. Such variation as presently exists in the north can only have grown up in the past five and a half thousand years.

The island of Madagascar, off the southeast coast of Africa, is another example here. Notice that it is also assigned a sub-region unto itself. The Flood line passes through the northern part of this island. Its unique pre-Flood fauna would have been preserved south of the line during the Flood. Thus the hemispherical Flood model predicts that Madagascar should have a native pre-Flood fauna today. Its designation as a sub-region of the Ethiopian region, which we have already seen is pre-Flood, shows that this prediction is correct—the fauna of Madagascar is, like that of mainland Africa with which it is broadly grouped, clearly pre-Flood in origin. But its placement in a separate sub-region shows that its fauna is also distinct from that of mainland Africa.

These observations seem quite significant. Notice that isolated islands north of the Flood line, such as Iceland, Japan, or Great Britain, do not achieve separate sub-region status. The clear implication is that regional variation was preserved to the south, but erased to the north of the Flood line at some point in the relatively recent past. This is precisely the result one would expect from a hemispherical Flood.

Oriental Region

Only one large scale feature of Figure 1 remains unexplained. Why do *two* zoogeographical regions, entirely north of the Flood line, exist? Why does the Oriental region exist in Asia, distinct from the

⁹Ernest Ingersoll, “Zoogeography,” *The Encyclopedia Americana*, vol. 29 (Chicago: Rand McNally, 1962) 728.

¹⁰Ernest Ingersoll, “Zoogeography,” *The Encyclopedia Americana*, vol. 29 (Chicago: Rand McNally, 1962) 728.

Holarctic region? Shouldn't there be only one region?

Here again I feel somewhat out of my depth, but let me at least make a suggestion.

I pointed out some months ago, while we were still developing the (now superseded) pelagic Flood model, that the Tibetan Plateau ("the roof of the world") may not have been flooded at the time of the Flood because of the extreme elevations (16,000 feet average) characteristic of that region.¹¹ (This is one of the subtleties in tracing the boundaries of the Flood alluded to above.) This observation still stands. It seems possible that the Tibetan Plateau may, uniquely of all the northern impact hemisphere, have been spared from the water of the Flood because of its extreme altitude. Is it possible that some animals from, say, India, which borders Tibet to the south, were able to find refuge from the Flood in the lofty reaches of Tibet, thus preserving some pre-Flood regional variability north of the Flood line, and that these survivors gave rise ultimately to the diversity of the Oriental region?

Conclusion

While much research yet remains to be done, it is clear, even at this early stage, that the hemispherical Flood model provides successful explanations of the basic observations of the science of zoogeography. In closing I want to point out that these explanations are potentially falsifiable—they are thus legitimate *scientific* explanations.

For example, we have just seen that a major prediction of the hemispherical Flood model is that variability of faunas north of the Flood line should be much less than variability south of the Flood line because of the extermination of life north of the Flood line 5500 years ago. In principle, global variability might have shown any of an infinite number of patterns, including enhanced variability in the north relative to the south (i.e., the opposite of what was predicted) or no obvious trend of any sort. But significantly reduced variability in the north is, in fact, what is actually observed.

A second major prediction of the hemispherical Flood model is that boundaries of regions which

were not entirely flooded may be expected to extend to the north of the Flood line because of diffusion of pre-Flood populations from the south into the depopulated north, but not the other way around because of the "organic barrier" posed by the established, native faunas south of the line. This prediction could have been falsified by any extension to the south of the Flood line of the Holarctic region—into the vast and varied Australian region, or the Ethiopian region, or the Neotropical region. But no such extension is observed; the southern regions systematically extend to the north of the line and not the other way around, as predicted.

The success of the hemispherical Flood model in explaining the basic observations of the science of zoogeography contrasts sharply with the dismal record of the global Flood model in this regard. The fact is that the global Flood model offers *no* intelligible scientific explanation of zoogeography, as I have previously pointed out.¹² The most basic expectation of that model is that the whole earth should be inhabited by a conspicuously uniform fauna. But that expectation is shown to be false by the actual field data of zoogeography. The sharp separation between marsupials and placentals represented by Australia, for example, is both glaringly real and stubbornly inexplicable within the global Flood model.

It is the usual procedure in science to separate valid explanations from those which are false by comparing their divergent predictions to real-life data. The global and hemispherical Flood models are competing explanations of Noah's Flood. They each make predictions about the distribution of animals which should be observed on the globe today. Their respective predictions are quite different. Zoogeography furnishes the basic real-life data for comparison to these predictions. The predictions of the hemispherical Flood model succeed, while those of the global Flood model fail. Thus it is appropriate to conclude that zoogeography strongly corroborates the hemispherical Flood model and shows the global Flood model to be false. ◇

¹¹Gerald E. Aardsma, "The Depth of Noah's Flood," *The Biblical Chronologist* 3.3 (May/June 1997): 8.

¹²Gerald E. Aardsma, "The Cause of Noah's Flood," *The Biblical Chronologist* 3.5 (September/October 1997): 5–6.

Reader's Write

Following my publication of the hemispherical Flood model in the Volume 3, Number 5 issue of The Biblical Chronologist I received a number of letters from subscribers and friends expressing concern that the hemispherical Flood model seems to them to be prohibited by the Bible. "Doesn't Genesis teach that the Flood was global?", has been the frequently repeated question.

I address that question here this issue. I begin by fielding a letter by Carol Johnson which seems to me to express this concern especially clearly and forcefully. My response then follows.

Background to Carol Johnson's letter can be found in two former issues. In Volume 3, Number 1 I pointed out that there are two perspectives from which Genesis 7 and 8 can be read, and that the perspective one adopts will color their interpretation of the Flood account.¹³ If one adopts the perspective that these chapters record God's observations of the Flood, then these chapters immediately seem to imply a global Flood. If, on the other hand, one adopts the perspective that these chapters record Noah's observations of the Flood, then a global Flood does not seem necessarily implied.

This matter surfaces again briefly in Volume 3, Number 5 where I mention that the observation of Genesis 7:19 that "all the high mountains everywhere under the heavens were covered" leads only to the conclusion that all of the mountains within Noah's visible range were submerged (rather than the conclusion that all mountains on earth were submerged) if the perspective that Genesis 7 records Noah's observations (rather than God's) is adopted.¹⁴

Does Genesis Teach that the Flood was Global?

Dear Dr. Aardsma,

Your new theory on the cause of Noah's flood was quite fascinating, and certainly seems possible to have occurred. But I have difficulty accepting the HEMISPHERICAL flood model, not because it is not feasible scientifically, and not because it

seems bizarre and unbelievable, but because it does not fit with the narrative in Genesis.

Yes, it could be from Noah's perspective that all the high mountains were covered, when there were others beyond his vision that were not, but there are other statements in the narrative that were made by God himself that indicate that the flood was global, since these statements are all inclusive!

To say that the flood covered only the Northern hemisphere means that almost the entire continent of South America, half of Africa, and all of Australia and Antarctica would not have been covered with water. How then could God declare, "And behold I, even I, do bring a flood of water upon the earth, to destroy all flesh, wherein is the breath of life, from under heaven; and everything that is in the earth shall die." [Genesis 6:17]? I would presume that God meant what he said when he said "all flesh" and "everything" and that this would include the flora and fauna of Africa, South America, and Australia - including kangaroos! This would have to be true according to the text unless there were no animals or people in those continents at the time. Are you then claiming that the animals of the Southern Hemisphere were not killed in the flood?

As if the statement in Genesis 6 were not enough, God says in Genesis 7:4 "...and every living substance that I have made will I destroy from the face of the earth". Clearly stating the results of the flood in Genesis 7:21-22, He says, "And all flesh died that moved upon the earth, both of fowl, and of cattle, and of beast, and of every creeping thing that creepeth upon the earth, and every man: All in whose nostrils was the breath of life, of all that was in the dry land, died."

God states in Genesis 7:23 that "...every living substance was destroyed which was upon the face of the ground ...and only Noah remained alive, and they that were with him in the ark."

Those statements seem to plainly say that every animal was killed by the flood. That would have to include Africa, South America, Australia, and Antarctica.

Is it possible that the life in the Southern Hemisphere was wiped out with something other than the flood (possibly the disappearance of the oceans for a year) since it says "all that was in the

¹³Gerald E. Aardsma, "Chronology of Noah's Flood," *The Biblical Chronologist* 3.1 (January/February 1997): 6.

¹⁴Gerald E. Aardsma, "The Cause of Noah's Flood," *The Biblical Chronologist* 3.5 (September/October 1997): 4.

dry land died.”?

Could the flood model you proposed have affected the continent of Africa, South America, and Australia, without affecting Antarctica? In other words would it be possible for the waters to have covered 2/3 of the globe rather than 1/2, leaving out the south polar region where no life existed? If the [inner] core of the earth did not reach the mantle but was only displaced part of the way, would the flood waters have covered at least part of the southern hemisphere, thus covering those continents?

I would hate to see the clear word of God compromised for the sake of a scientific theory, even one as well calculated as yours. As you well said, if we cannot trust the witness of Genesis, then there is no reason to trust the historical witness in the Gospel of John or the words of Jesus. Please explain to me why God said that ALL flesh died with the flood if the southern hemisphere was exempt? Maybe you should keep looking.

I would appreciate hearing your perspective on these questions. Thank you so much for the detailed research you are doing on chronology. It is much needed. May God bless your work.

Carol Johnson
Sykesville, MD

Dear Carol,

Thank you for your letter. You have done a good job of presenting your concern and focusing on the relevant facts. I think many Christians would tend to share this concern.

Let me clear up a few details before getting down to the heart of the matter.

First, you have asked whether there may be some way of making the hemispherical Flood model cover more of the globe. In fact there appears to be none. All of the computer modeling of the extent and motion of the waters which I have done to date suggests that hemispherical coverage is all one can reasonably hope for.

Second, you have asked whether life in the southern hemisphere might have been wiped out by something other than flooding—as a result of the loss of the southern oceans, for example. It is clear that life in the southern hemisphere must have been severely stressed by the Flood, but it also seems clear that there is no way every last air-

breathing, land-dwelling animal in the south would have succumbed to these stresses, as your current understanding of the verses you have pointed out demands. I do appreciate your efforts to get me “off the hook” with these suggestions, nonetheless.

Third, you have stated that “I would hate to see the clear word of God compromised for the sake of a scientific theory”. I want you to know that I agree with you very strongly about this. I have emphasized from the beginning that “I am a Bible-believing conservative Christian” and “I hold to the inerrancy of Scripture in the autographs”.¹⁵ Scripture must not ever be compromised to bring it into apparent agreement with the theories of men. God helping me, I will never do so.

I must add a flip-side to your assertion, however, which I hope you will agree with me on. That is that the truth of Scripture must never be compromised by any stubborn adherence on our part to interpretations of Scripture which prove to be false. The Bible is inerrant, but unfortunately, we, its human interpreters, are not. We must be willing to renounce not only our false scientific theories but also our false Bible interpretations, no matter how respectably traditional they may be, for the love of the One we follow. Do you agree?

Now let me move to the heart of the matter. The reason we have come to opposite conclusions regarding the Biblical admissibility of the hemispherical Flood model is because we have interpreted the verses you have alluded to differently. You have interpreted the “all”s and “every”s of Genesis 6 and 7 as “all inclusive”, by which you mean that none whatsoever is left out. This is a possible interpretation, but it is not the only possible interpretation. This is most clearly revealed by comparison with other Bible passages in which similar expressions are used.

The classic example here is Genesis 41:56&57, in reference to Joseph’s famine.

When the famine was spread over all the face of the earth, then Joseph opened all the storehouses, and sold to the Egyptians; and the famine was severe in the land of Egypt. And the people of all the

¹⁵Gerald E. Aardsma, *A New Approach to the Chronology of Biblical History from Abraham to Samuel*, 2nd ed. (Loda IL: Aardsma Research and Publishing, 1993) 19.

earth came to Egypt to buy grain from Joseph, because the famine was severe in all the earth.

This passage repeatedly says, “all the earth”. Taken at face value it seems to be an assertion that Joseph’s famine was a global phenomenon. That means it would have extended to Australia, the Americas, and into the Arctic.

The passage clearly and explicitly says, “And the people of all the earth came to Egypt to buy grain from Joseph”. Did Australian aborigines, American Indians, and Arctic Eskimos go to Egypt to purchase grain from Joseph during the seven years of famine? Please understand that I am prepared to believe that Eskimos paddled their kayaks across the Atlantic ocean, the Mediterranean sea, and up the Nile river if that is what the Bible teaches. But I know of no Bible scholar who would suggest that that is what the Bible intends for us to understand by these “all”s.

The hermeneutical lesson which these verses teach us is that it is possible for language to be used in Genesis which appears to be explicitly global, but which, in fact, must be understood as intended only to express the idea of a most unusual magnitude.

Genesis 41:56&57 open the door to the possibility that the language you have pointed out in Genesis 6 and 7, which also appears explicitly global, may, in fact, be referring to something which, while of stupendous proportions, was not global. This means that there are two possible, Bible-honoring interpretations of the verses you have pointed out in Genesis 6 and 7. One demands a global Flood. The other allows that possibility, but does not demand it.

To the best of my knowledge there is no rational way to choose confidently between these two interpretations based on the Biblical text alone. Whitcomb and Morris have attempted to do so in their book, *The Genesis Flood*, but I think we must judge their effort a failure.

They advance three points in this regard. The first is that “most universal terms [in the Bible] are to be interpreted literally”.¹⁶ I concede this point,

¹⁶John C. Whitcomb, Jr. and Henry M. Morris, *The Genesis Flood* (Philadelphia: The Presbyterian and Reformed Publishing Company, 1961), 56.

but I fail to see how it helps us to choose confidently between the two possibilities in the specific case in question. Is this specific case one of the majority, or is it one of the minority?

Their second point is that “the context determines the meaning”.¹⁷ They clarify what they mean by this in this specific case by quoting M. M. Kalisch and italicizing for emphasis “*the universality does not lie in the words merely, but in the tenor of the whole narrative*”.¹⁸

The statement that “context determines meaning” is a sound hermeneutical principle, but it cannot be applied in the sense of Kalisch’s quote in this instance. To do so is to commit the logical error called begging the question.

The whole question under consideration is “Does Genesis teach that the Flood was global?” The “yes” side has advanced the argument that the “all”s and “every”s of Genesis 6 and 7 show that the Bible does teach that the Flood was global. The “no” side has advanced a counter-example; they have shown a case in Genesis where a lot of “all”s similar to those in Genesis 6 and 7 don’t equate to global. Whitcomb and Morris reply for the “yes” side. They say that the counter-example does not apply to the “all”s in Genesis 6 and 7 because context determines meaning and the whole context of Genesis 6 and 7 is global, showing that the “all”s of Genesis 6 and 7 are meant to be understood globally. But that is begging the question. To say that the context (i.e., “the tenor of the whole narrative”) of Genesis 6 and 7 is global is just a way of asserting that Genesis teaches the Flood was global. But this cannot be asserted (as a premise) since it is, in fact, the question which we are attempting to resolve. Obviously, the “no” side does not grant the premise that the whole context of Genesis 6 and 7 is global. That is what the “yes” side must *prove* if they wish to convince the “no” side.

Whitcomb and Morris state their third point as follows [original emphasis throughout]:¹⁹

¹⁷John C. Whitcomb, Jr. and Henry M. Morris, *The Genesis Flood* (Philadelphia: The Presbyterian and Reformed Publishing Company, 1961), 56.

¹⁸John C. Whitcomb, Jr. and Henry M. Morris, *The Genesis Flood* (Philadelphia: The Presbyterian and Reformed Publishing Company, 1961), 57.

¹⁹John C. Whitcomb, Jr. and Henry M. Morris, *The Genesis Flood* (Philadelphia: The Presbyterian and Reformed

But our third and most impelling reason for interpreting the universal terms of Genesis 6–9 literally is that *the physical phenomena* described in those chapters would be quite inconceivable if the Flood had been confined to one section of the earth. While it would be entirely possible for a seven-year famine to have gripped the Near East without at the same time affecting Australia and America (cf. Gen. 41:57), it would *not* have been possible for water to cover even *one* high mountain in the Near East without inundating Australia and America too!

I have shown that, according to the laws of physics (in particular, the law of gravity), it *is* in fact possible for water to cover mountains in the Near East without inundating Australia.²⁰ Thus this third point also falls to the ground.

I repeat: to the best of my knowledge there is no rational way to choose confidently between the global and non-global interpretations of Genesis 6 and 7 based on the Biblical text alone. Both interpretations are possible if the question is confined to Biblical material only.

But only one interpretation can be true. The Flood was either global in extent, or it was not. One of these two interpretations must be false. As long as Biblical data are all one has available on this interpretive question, one is well advised to allow both possibilities to stand, so as not to arbitrarily reject the truth and embrace error.

But, fortunately, the debate is no longer restricted to Biblical data alone. The date of the Flood is now clear, and the nature of this historical event is daily becoming more obvious through the application of previously amassed scientific data within its proper chronological context. We are, admittedly, only at a very early stage in this process. Nonetheless, I would be a less than faithful witness if I failed to state clearly that I judge the scientific data which has been explored to the present time to be already conclusive against the global Flood interpretation of Genesis 6 and 7.

But while it has been my privilege to delve into the scientific data, and to feel its impact first hand,

you have had to wait on me, and learn about the scientific data second hand through my poor pen. So I will certainly not fault you if you choose to suspend final judgment on this interpretive question for some time yet.

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Research in Progress

The Waxing of the Flood

Last issue I published a figure explaining Noah's observations of the depth of the Flood in the Ararat region in terms of the dynamics of the inner core of the earth.²¹ That figure is reproduced here (somewhat compressed) as Figure 3. In the figure the Flood is divided into three stages: waxing, maintaining, and waning.

Since last issue I have constructed a computer program to enable me to study the waxing stage of the Flood. My purpose was to learn what I could about the motion of the water of the world oceans at the beginning of the Flood. How long would it have taken for the water to reach its maximum depth? And what was the depth distribution of the water over the surface of the earth during the waxing of the Flood?

I have had to simplify the problem considerably relative to real life in order to make any reasonable headway. For example, I have approximated the earth by a smooth sphere covered initially by a universal ocean. Thus I have totally neglected the actual topography of the surface of the earth, including the presence and distribution of the continents in my computer model. Obviously, in real life these would have had a significant impact on the motion of the waters, especially initially. I have also completely neglected the rotation of the earth.

It is clear that quantitatively precise results can hardly be expected in such a case. But helpful qualitative insights can still be obtained, and it is these which I wish to report on here.

Publishing Company, 1961), 60.

²⁰Gerald E. Aardsma, "The Cause of Noah's Flood," *The Biblical Chronologist* 3.5 (September/October 1997): 1–14.

²¹Gerald E. Aardsma, "Research in Progress," *The Biblical Chronologist* 3.6 (November/December 1997): 17.

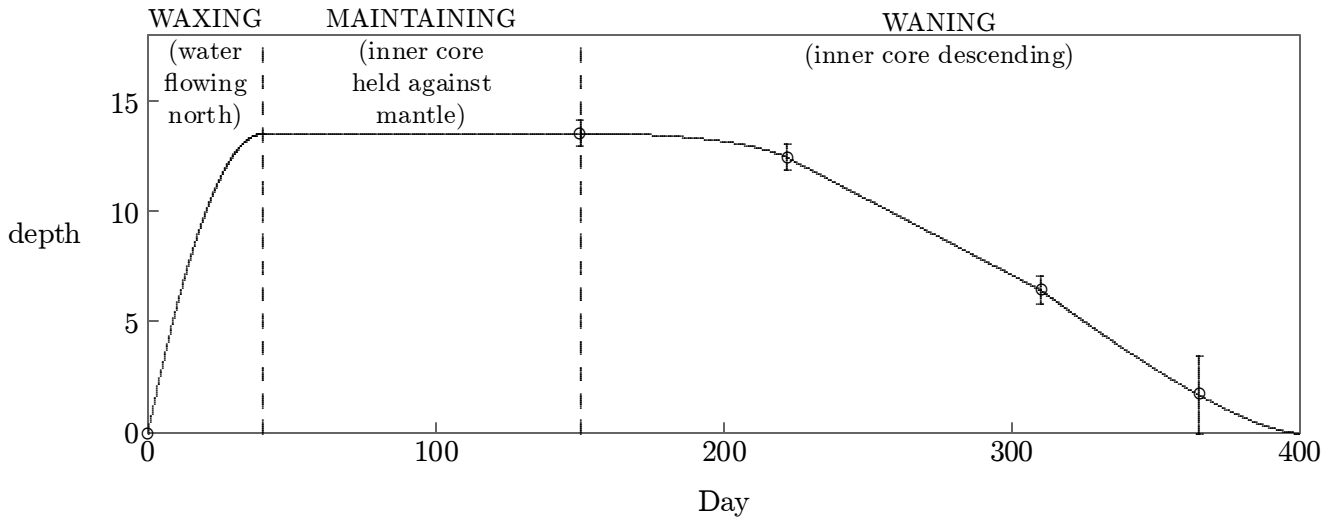


Figure 3: Old diagram explaining the stages of the Flood. (Solid line is heuristic only.)

The computer model

The computer model was designed as follows. I broke the world ocean up into 721 rings of water, symmetric about the impact center of the cosmic projectile. These rings were assigned a fixed volume of water, according to their position on the globe, to simulate uniform depth at the start of the calculation. The rings were allowed to move latitudinally (i.e., tangential motion only) in conformity with Newton's laws of motion. An adjustable frictional force, proportional to the square of the velocity, was applied to each ring. No other dissipative terms were included.

The motion of the inner core of the earth from the center to the mantle was approximated by the equation:

$$d = d_{max} \times (1 - \exp^{-v_0 t / d_{max}})$$

where d_{max} is the maximum possible displacement of the inner core, and v_0 its initial speed due to the cosmic projectile impact.

The resulting set of coupled differential equations was solved numerically using a quartic Runge-Kutta method. At each time step the new velocities and angular positions of the water rings were computed. From the positions of the water rings the implied global height distribution of the water was obtained.

Each water ring starts out having a tangential velocity resulting from the cosmic projectile impact. The rings at the north and south "impact poles" have zero tangential velocity; the ring at

the "impact equator" has maximum tangential velocity. (By "impact poles" and "impact equator" I mean to convey a coordinate system like that which is normally used on a globe except for the fact that it has been rotated to bring the north pole (of the coordinate system, not the earth) into coincidence with the impact crater. Thus the "north impact pole" lies over the impact center, the "impact equator" is 90° from the impact center in all directions, and the "south impact pole" is on the opposite side of the globe from the "north impact pole". I drop the quotes on these descriptors in what follows.)

Qualitative results

This rudimentary computer model has revealed several qualitative features of the waxing of the Flood which I had not previously suspected—though they seem obvious enough in hindsight.

First, the rise of the Flood was probably much more rapid than I have shown it to be in Figure 3. One day (i.e., roughly 24 hours) appears to be a more accurate approximation of the length of time required for the water to achieve full Flood depth in the Ararat region than forty days. This suggests that Figure 3 should be corrected as shown in Figure 4. This further suggests that the "forty days and forty nights" of Genesis 7:4,12&17 is a reference to the duration of the rainfall associated with the Flood only, rather than a reference to the length of time required for the Flood to achieve full depth as I had previously suggested might be

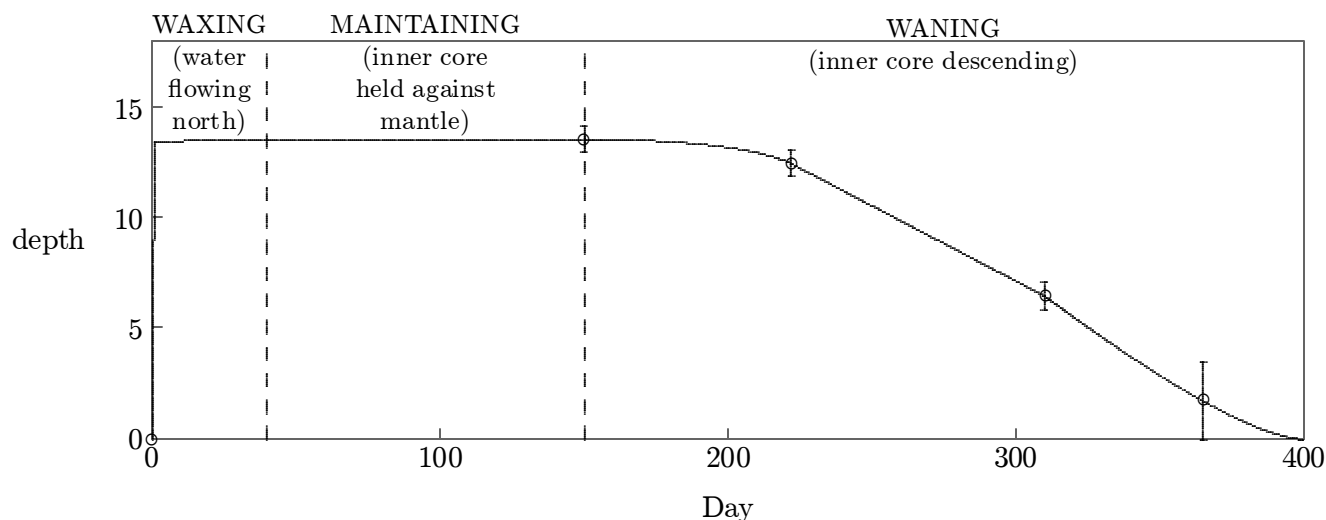


Figure 4: New diagram explaining the stages of the Flood. (Solid line is heuristic only.)

the case.²²

The second qualitative feature of interest is that the waxing stage appears to divide into three phases. These are: i. initial pulse, ii. reflected pulse, and iii. final flow.

The initial pulse occurs in the first few hours after impact. It is caused by the (tangential) velocity toward the impact center imparted to the oceans (relative to the solid earth) by the cosmic projectile impact. This results in a rush of water toward the impact center, and, ultimately, in a *very* great heap of water over the impact crater. The height of the heap is determined by the velocity imparted to the earth by the cosmic projectile and the friction experienced by the water as it flowed northward. This latter quantity is poorly constrained at this point, allowing a wide range of possible heights, but three average ocean depths above mean sea level is probably a minimum figure.

This initial pulse manifests itself differently at various impact latitudes in the computer calculation. At the north impact pole the water depth increases monotonically and rapidly. In the southern impact hemisphere (i.e., greater than 90° from the impact center) the water depth decreases monotonically and relatively slowly. At intermediate impact latitudes in the north, especially toward the impact equator (at 30° from the impact equator, for example) it is possible for the water to rise at first and then fall again, even falling below mean sea level. This results from the fact that the

greatest volume of water is at the impact equator, and this water also has the greatest tangential velocity toward the impact center initially. A traffic jam results initially, causing the water to pile up. But the depth begins to decrease again (at 30°) as the high-volume, high-speed pulse moves rapidly to the north (even though water is still flowing into the 30° impact latitude from the south).

The reflected pulse phase begins when the mountain of water which has been accumulating over the impact crater begins to collapse under its own weight. Water now begins to flow outward from the north impact pole toward the south (even as, away from the pole, it continues to flow toward the pole from the south). The result is an enormous reflected pulse of water. (Picture—in slow motion—the slopes of a smooth mountain of water, with no walls to hold them in, slowly spreading out as the mountain collapses under its own weight.)

The reflected pulse develops a very steep (and very high) leading edge by about 45° from the impact center. This is due to the fact that the water at its base is still flowing north—the tail of the initial pulse—while the reflected pulse itself is being impelled south by the hydrostatic pressure of the water-mountain which lies behind it.²³ The profile of the water is like an ocean-high cliff face at this

²²Gerald E. Aardsma, “Research in Progress,” *The Biblical Chronologist* 3.6 (November/December 1997): 15–16.

²³I found it necessary to apply a three-point binary smoothing to the water rings’ velocity and position arrays after each Runge-Kutta iteration to keep the calculation stable at this point. First derivatives are otherwise discontinuous near the “crest” of the reflected pulse.

point.

The cliff face moves toward the south, diminishing in height as the volume of water in the mountain is spread out over an ever larger area of the earth's surface. However, the cliff face is moving at tsunami speeds. It seems appropriate, in fact, to refer to this reflected pulse, once it has developed its cliff-like aspect (beyond about 45° from the impact center) as a world-circling tsunami. This is a little inadequate, however, since the typical tsunami is only about a meter high in the open ocean (tsunamis only become tall waves as they come into shallow water), and this reflected pulse is on the order of a thousand times that height.

The altitude of this Flood-tsunami diminishes rapidly until it drops below mean sea level near the impact equator. (It is still three quarters of an ocean in height, however. Its altitude is low only because its base has dropped deep below mean sea level. Its base can drop this low because the southern ocean has been drained to that depth by this point.) The actual altitude of the Flood-tsunami as it crosses the equator depends substantially on where the inner core has gotten to by that time in the calculation. The slower the motion of the inner core away from the center of the earth, the greater the altitude of the Flood-tsunami when it reaches the equator. This is because the gravitational attraction of the inner core "traps" more water in the north the closer it is to the mantle.

Unfortunately, the actual speed of the inner core relative to the speed of the oceans is another parameter which is not well constrained at this early stage of investigation. As a result it is not possible to make quantitative statements about the actual depth of the Flood-tsunami near the impact equator. Nonetheless, for all choices of input parameters which I have tried so far I have found that the reflected pulse significantly increases the Flood depth near the impact equator relative to the static depth profiles calculated previously.²⁴ When the tsunami-like characteristics of this return pulse are taken into account, it seems inevitable that the extermination of life occasioned by the water of the Flood must have extended very nearly to the impact equator. Extension much beyond the impact equator does not appear likely, however,

because the altitude of the Flood-tsunami drops very rapidly below mean sea level as it continues on toward the south.

The final flow phase begins once the Flood-tsunami has dissipated (i.e., after about 24 hours). The inner core is expected to have reached the mantle for certain by this time and much of the water of the oceans has already been held in the north by the gravitational attraction of the inner core. All that remains is a tidying up. Water continues to flow from the south into the north until the static Flood profile previously calculated is achieved.

Noah's Observations

How much confidence should be placed in these computer modeling results at this point? This is not an easy question to answer. The real-life problem is an extremely complex one in the field of fluid mechanics, involving both the fluid of the oceans and the fluid of the outer core of the earth. There is no question but that my computer model is an oversimplification. Can even its qualitative results be trusted? The best way I know to answer this question is to check the results of the computer program against Noah's observations of the Flood.

To do this one needs to know at what impact latitude Noah's observations were made, since, as I have indicated above, the phases of the waxing of the Flood were manifested in different ways at different points on the globe. This brings us face to face with the fact that we don't know exactly where the ark was built or from what point the initial observations of the Flood were made. But three factors suggest that the location was probably somewhere in Mesopotamia.

First, the Genesis narrative preceding the Flood account has established a setting in and around the Garden of Eden, and the Garden of Eden is placed at the confluence of the Tigris and Euphrates rivers in Mesopotamia in Genesis 2:14.

Second, it appears from archaeological investigations that Mesopotamia was both the kernel and the hub of civilization back at the time of Noah. The technological capability required to construct a sea-worthy ark is not small, and it seems probable that such technology would have been most available near civilization's hub.

²⁴Gerald E. Aardsma, "The Cause of Noah's Flood," *The Biblical Chronologist* 3.5 (September/October 1997): 11.

Third, since the ark was without locomotive power, it simply drifted upon the Flood water. It was obviously subject to currents and winds. If these currents and winds varied in intensity and direction in a somewhat random fashion, then the ark's path upon the surface of the Flood water would be what physicists call a "random walk". The important thing about random walks for the present case is that no matter how many steps are taken, one is most likely to end up not too far from where they began. This is helpful because we do know that the ark landed in the Ararat region, and this, of course, is just to the northwest of Mesopotamia.

The Ararat region is about 35° from the impact center (assumed to correspond to the Kara Sea), and the base of Mesopotamia, where the Persian Gulf begins, is about 43° away. Thus Noah's observations should, apparently, be compared to the computer results for this approximate range of impact latitudes.

In fact, this works out quite well. I mentioned above that at some latitudes the computer calculation shows an initially rising Flood depth, only to be followed a short while later by the depth dropping below zero. This would correspond to the ark being lifted initially, only to be set back down again a short while later. Noah records no such episode, and the computer calculation agrees. This behavior, as mentioned above, tends to be a characteristic of the Flood nearer to the impact equator than Noah appears to have been situated.

Notice also that Noah fails to report sighting or otherwise experiencing a tsunami. This is also in accord with the computer model. As mentioned above, the Flood-tsunami only seems to take shape beyond about 45° from the impact center. Noah's location at the start of the Flood is such that the ark and its contents were, in all probability, safely to the north of it.

These are both negative predictions—what Noah should *not* have observed. There is also a positive prediction. According to the computer model the rise of the Flood in Noah's region, while very rapid in both the initial and the reflected pulse phases, should nonetheless have been *more* rapid during the (later) reflected pulse phase than it was during the initial pulse phase. This results from the rapidly increasing depth of water

in Noah's region during the reflected pulse phase as the water mountain above the impact center began to collapse and spread its flanks.

This accelerated uplift of the ark does seem to find support in Genesis 7. In verse 17 Noah records, "and the water increased and lifted up the ark". This is readily identified with the primary pulse. Then, in verse 18 we read, "And the water prevailed and increased *greatly*" [my emphasis]. This seems to resonate naturally with the predicted, accelerated rate of uplift during the reflected pulse phase.

While precise quantitative accuracy cannot be hoped for from this simple model, it does seem likely that the qualitative aspects of the waxing of the Flood which it has revealed were a real part of the actual Flood. Indeed, it is difficult to see how they could not have been. Notice, for example, that even if the height of the predicted Flood-tsunami was to be found by future, more sophisticated computer models to have been overestimated by a factor of 1000 (which seems *most* unlikely) one would still have a Flood-tsunami. Seismic events do produce tsunamis, and the collision of the cosmic projectile with the earth most certainly qualifies as a seismic event. Thus I expect the initial and reflected pulses, with their respective water mountain and Flood-tsunami, to show up as persistent features in all future, more precise efforts to model the waxing of the Flood—however refined their timing and magnitude may become. On this basis it seems appropriate to formally include these phases and phenomena in the hemispherical Flood model at the present time.

Was the Flood a Cataclysm?

There are two parameters which can be used to categorize various models of the Flood. The first is the *geographical extent* of the Flood, and the second is its *geological potency*. The first parameter answers the question, "What fraction of the earth's surface was covered by the water of the Flood?" The second answers the question, "How much did the Flood reshape the surface of the earth?"

These parameters should be treated as continuous variables, having a continuous range of possible values. Unfortunately, they have often been treated as binary variables, having only two possi-

ble values.

Discussion regarding the first parameter—the geographical extent of the Flood—has often been framed as a choice between two alternatives: global (100% coverage) or local (<1% coverage). These two extremes have historically been championed, with a large measure of zeal at times, by two opposing “camps”.

While I personally have had no preference for any given value of this parameter (my only interest has been to find out the truth), I cannot help but smile at the way the truth seems to be coming out. The hemispherical Flood model is yielding roughly 50% coverage—right in the middle!

The second parameter—the geological potency of the Flood—has also tended to be polarized into two extremes: tranquil (in which the Flood has zero impact on the surface of the earth) and cataclysmic (in which the Flood completely reworks the surface of the earth, with intense global erosion, deposition of miles-deep stratified sediments all around the world, massive tectonic uplift of mountain ranges globally, rapid subduction of the ocean floor, and even continents breaking apart and redistributing themselves over the face of the globe).

Here again I have had no preference but to find the truth. And here again I cannot help but smile at the way the hemispherical Flood model is turning out.

If we ask the hemispherical Flood model, “Was the Flood tranquil?”, the answer is “Most certainly not.” An ocean-high, world-circling tsunami is bound to have accomplished some erosion. The cosmic projectile impact, the rush of water to the impact center, and the reflected pulse are in the category of catastrophic phenomena, geologically speaking. They cannot be labeled “tranquil”. The day the cosmic projectile struck can only be perceived as a day of sudden terror and unimaginable calamity.

But let us now ask, “Was the Flood a cataclysm?” How many continents broke apart and moved to new locations on the globe? Zero. How many ocean floors were subducted? Apart from the tiny piece of sea floor in the immediate path of the cosmic projectile (which wasn’t exactly *subducted*), zero. How many mountain ranges were uplifted? Again, other than a relatively tiny rim

around the impact crater, zero. How much of the surface of the earth was eroded away? Apparently very little. Please note that pre-Flood archaeological remains, such as the Chalcolithic temple structure we saw in the previous issue, are still found in place throughout Palestine and the Near East. Tsunamis, while quite effective at destroying life, generally do not do an enormous amount of geological work—their action at a particular site may be intense, but it is also very brief. How many miles of sediment were piled up around the globe? I have no numbers on this, but I would venture the global average was closer to an inch than a mile.

Note also that catastrophic phenomena seem only to have characterized Day 1 of the Flood. No world-circling tsunamis have been found, or are expected to be found, in the remaining 364 days of the Flood. For the great majority of the time one seems to be dealing simply with a seriously displaced but otherwise normal ocean.

Was the Flood a cataclysm?

Most certainly not. ◇

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:

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