ARTICLE II.

THE GLACIAL EPOCH AND THE NOACHIAN DELUGE.

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IV.

GEOLOGISTS have often been prodigal of time, and some of them have carried their prodigality to excess. This is the more surprising, when the known and visible effects of erosion during the past twenty-five hundred years are considered; for it is practically certain that nature's destructive agencies are now far milder than they have been in former eras. Incidentally, the Age of Man has been made unduly long. Other scholars, relying upon insufficient data, have made it unduly short. The date of the flood, being made to correspond, has been placed by the latter at a time entirely too recent to accord with the requirements of Geology, while geologists — if they have admitted the possibility of a deluge at all — have pushed it back to a time inordinately remote.

It is not an easy matter to determine; to settle it beyond dispute is out of the question; and yet the time may come when it will no longer be of its present doubtful character. A compromise may make this possible; but it must have a due regard for all the elements in the problem. The geological estimates vary greatly. The most conservative is that of Dr. Wright, who, in deference to his colleagues, makes an allowance of about three thousand years in addition to the time required by his own careful computations. He accordingly places the flood

at about 8000 B.C., a comparatively recent date, when other geological views are considered.

The data used by Dr. Wright were gathered at the Niagara River and in the upper Mississippi basin near Minneapolis. The Falls of St. Anthony, like those of Niagara, have eroded a gorge about seven miles in length since the close of the Glacial Epoch, or since the retirement of the ice which dammed the old river bed so effectually with its *débris* that a new passageway had to be cut by the stream. It is supposed that this latter event marked the end of the epoch; but that was apparently the time of the flood, and the problem has therefore resolved itself into the question How long did it take to erode those gorges? Ancient maps and surveys of known date make it clear that the rate of erosion for each has been approximately five feet a year, or about a mile in a thousand years, if the rate has remained constant. The date required would thus be about 5000 B.C., or possibly 6000 B.C., if allowance is made for the odd feet in a mile.

To so late a date geologists object, because it does not harmonize with their theories concerning geological time. In support of their contention, they point to the evidence, in the case of Niagara, of an ancient drainage of the Erie-Ontario depression, *via* the Mohawk River or some other stream, before the final disappearance of the glacial ice; and they would therefore add thousands of years to the time required for the erosion of the seven miles of channel by placing the end of the Glacial Epoch just that much earlier. But there are reasons for taking a view diametrically opposite to this and reducing the figures by at least a thousand years.

The periods occupied by these other methods of drainage are confessedly uncertain; and, on their own showing, they were too early to affect the date sought, since no ice barrier

of the kind they postulate can have existed after the flood to hold back or turn aside the drainage of the Erie-Ontario basin. The Mohawk route [1] must therefore antedate the close of the era, as must also every other in all probability except that of the Niagara River, which was made available only after the melting of the ice had opened the Mohawk route and greatly lowered the water in the basin. But if any part of the present Niagara gorge was ever available for drainage purposes before the final destruction of the ice, the end of the era and the date of the deluge must be placed proportionally later, since some erosion must have taken place whenever any drainage by that route was rendered possible. But there are other and more important elements to be considered.

The amount of water passing through a given channel determines the amount of erosion accomplished in a given time. On this all are agreed. Now, it is certain that the territory occupied by the United States was for centuries after the Glacial Epoch the home of vast inland lakes, beside which, by comparison, the "great lakes" of our own day seem insignificant. But such enormous sheets of water, even if the sun could exert but half its present influence for lack of a clear sky, would lead inevitably to an excessive evaporation, which would in turn render the precipitation far greater than anything now known in the same regions. Swollen streams would thus become a necessity to take care of the rainfall, and, indeed, the very lakes themselves would involve such streams as an indispensable part of their being. It is therefore to be presumed that not only the Niagara but also the Mississippi gorge carried a greater volume of water at some time in its history than that now in evidence.

[1] See Wright, Man and the Glacial Period, pp. 92 ff., 220 ff., 339; Scientific Confirmations of Old Testament History, pp. 229 f., 330 f.

The two gorges have another common characteristic, which has apparently been overlooked, as a factor in the problem, by all those using their erosion as a means of computing time; namely, their relative width, and that of their channels, in the old and new portions. Dr. Wright has incidentally called attention to this feature,[1] and it is strongly marked in both instances.[2] That this element is of vital importance cannot be doubted, much less questioned, when it is remembered that the narrowing of a channel always inevitably deepens to a proportional degree the volume it must carry to accommodate a given amount of water, though the speed of the current must also be taken into the account. As increased speed, however, would more than make up for any diminution of volume occasioned by it, it may be ignored in this connection.

It is now argued respecting the Mississippi that the drainage below the Falls of St. Anthony has improved with the years; that the erosion has therefore been more rapid in recent centuries than it was in the early days; and that, on this account, more time must be allowed for the results obtained than present rates would signify. This reasoning is clearly fallacious on several grounds. The old gorge, now partially filled with glacial *débris,* lies to the west of the modern one. It is from two to eight miles in width between the faces of the bluffs on either side, and its buried channel is of a width to correspond. The new gorge is a scant quarter of a mile in width, and its bluffs are high and steep. Its channel is proportionally narrow.

The exact history of the falls does not seem to have been worked out; but the gradient is not affected thereby, and the

[1] See Bibliotheca Sacra, vol. xli. pp. 369 ff., and Man and the Glacial Period, pp. 208 ff., 333 ff.

[2] See *l. c.*, and Cent. Dict., vol. x. map 13.

water must have descended just so far to reach the ancient channel at the point where the Mississippi resumed its original course. It may have made the descent by small separate falls, or by rapids — continuous or otherwise, — or by a combination of falls and rapids, or by a succession of falls similar to those now found in Minneapolis. The chances are that changes, more or less marked, have taken place in the character of the descent with the lapse of the centuries. Its total amount, however, is not great, and the possible variations are therefore somewhat limited.

The new gorge ends not far beyond the present location of the falls; and the Mississippi, both above and below it, appears to have had a greater width at the start than the stream in the new gorge ever attained. It must have corresponded, in fact, to the former channel in the broad ravine to the west, now choked with glacial *débris*. This very obstruction in its pathway was the thing which caused the river to abandon its ancient bed and cut a new channel for itself in the neighborhood. But if the river had a greater width both above and below the new gorge, it must have had a greater carrying capacity also. From this conclusion there is no escape; and, furthermore, in the beginning there was no channel at all for some miles just after the completion of the damming process. The water must have been held back, therefore, until it had acquired sufficient "head" to force its way through some weak spot in the bank and begin the cutting of a new excavation.

Now, it is not to be supposed that the glacial *débris* was entirely confined within the narrow limits of the ancient gorge. Glacial ice is not so particular as that; and it is more than likely that loose material was to be found on the river banks also, through which the water was forced to cut its way. In

the erosion that followed, this material was a factor. Doubtless a small and narrow stream began at first to trickle between the rocks where the least resistance was offered to its passage; but it must have gathered headway as it went, and a channel would thus be eroded with increasing rapidity. Stones and loose gravel on the sides were doubtless undermined and carried onward by the growing stream, and the loose earth beneath soon showed the effects of their action; for a deep and narrow channel was evidently cut to bed-rock and cut quickly. Erosion in this latter material has resulted in the present falls.

The very narrowness of the modern gorge and channel shows that they were excavated with such rapidity that the waters were accommodated by the increasing depth and were not forced to spread outward to any great extent as they grew in volume with the opening of a passageway. The size of the ancient gorge testifies to vast quantities of water at some stage in the river's history, and it is not to be supposed that the present volume of the Mississippi was at once attained when the Glacial Epoch ended and the ice disappeared. For many ages the flow must have been far greater than anything now known there, and the erosion could not fail to correspond. The glacial *débris* was certainly not exhausted by the first onset of the river, and for many decades afterward material of this kind must have continued in decreasing quantities to furnish its aid in the erosion that was going on in the new channel. The conclusion is inevitable. Present erosion is less rapid in its action than was that of the early days after the formation of the new gorge was started; and the year 5000 B.C. is therefore too early rather than too late a date for the beginning of the backward trend of the falls, which must have varied in a corresponding ratio.

But that is not all. The ancient bed below the new gorge — and above it — was both wider and deeper than the new channel that was forming, and this peculiarity must be allowed for. Both the speed of the stream and its erosive power would be checked thereby. The old bed, then, has suffered comparatively little change in the intervening ages, which can only mean that either the gradient of the new gorge or the height of the falls (or both) has been steadily diminishing from the start, so that the erosive power of the river has suffered diminution from this cause also, as has the speed of the backward movement of the falls themselves.

The new channel could not be made relatively deeper, as the two levels approached each other, without producing some such result, and this certainly had its influence. The deepening, moreover, instead of constantly increasing the average amount of water passing through the cut, would ultimately tend to diminish it, because the gorge itself would be affected so that less and less water would be held back in times of freshet in the broader parts of the ancient valley above. With each increasing foot of depth and breadth, the gorge could carry more and more water, and in times of flood the bluffs on either side and the bottom of the valley would be likely to suffer far more than the channel itself. The final outcome would be a gradual diminution in the amount of erosion in the channel proper, as manifested at the falls, because the gorge, as it became wider and deeper, would ultimately permit the excess of water to escape immediately, when the river overflowed its banks, instead of by degrees.

Improvement in the drainage is therefore no argument for an increase in the speed of erosion during recent centuries; for it has probably led to a reduction in the amount of water available for the purpose, during a part of the year at least,

provided a general average is struck. When the gorge was but little wider than the channel, practically all the water had to go over the falls in time of freshet; and the erosion must have been enormous. As the gorge widened, the overflow must have spread outward beyond the falls more and more in time of flood, and less water proportionally would then go over the brink, although a horseshoe effect would still be produced at its location. In time, the river bed would become deep enough to make overflows rare, and the amount of water available for erosion would thus be increased somewhat; but it would still be less, on the average, than it was under earlier conditions with a greater rainfall, and the slight increase of erosion that might follow, would be an actual diminution in comparison with earlier amounts.

If the total volume of water could have been confined to the new channel at all times, the diminution in the speed of erosion would have been continuous. As it was, the loss of speed must have been quite marked for some ages; but the rate of erosion would finally become fairly stationary, since any increase in carrying capacity would be fully offset, if it was not exceeded, by losses in the height of the falls and in the rapidity of the current and the amount of water available from precipitation, although temporary increases might sometimes occur from various causes. In the long run, the chances are that the rate of erosion would continue to diminish, on the whole, though it would do so very slowly when present conditions were attained. That the waters of the river have not always been confined to the channel, the gorge and its bluffs bear silent witness, and they testify to the probable accuracy of the above diagnosis.

At Niagara similar conditions prevailed; but the river was affected in a somewhat different way. The channel from the

falls to the whirlpool rapids is not wholly new; for there is an old outlet at the latter point. It is now filled with glacial *débris,* though it was once fairly wide and deep. Below the whirlpool, the gorge is entirely new, and, as far as Queenston, it represents an erosion produced by falls since the retirement of the ice or since the close of the Glacial Epoch. The escarpment ends at Queenston, and, from that point to the whirlpool above, it must have been cut away by the waters of the river. No falls were possible below the escarpment, so that this part of the problem is fairly well defined.

Several contingencies need to be allowed for. To begin with, the filling of the old outlet meant the complete damming of the river; for the escarpment was then unbroken by the present gorge. The water was thus held back and driven up stream, until it had risen to a point where it could find a way of escape. Whatever the location of the present falls may have been at that time, they must have occupied a point at least as far up stream as the whirlpool; and whatever channel may have existed between it and them must have been turned into a basin which was also filled with glacial *débris.*

When a new channel had been cut and the escarpment had been sufficiently eroded to allow the river to assume a normal condition, there may have been two separate falls with a space of several miles between them, — an insignificant one above the present whirlpool and a huge one below it. The erosive power of each depended upon the speed of the current as well as upon the amount of water passing over its brink; and, while the greater part of the erosion must have been at the lower cataract, the probable existence of the other fall complicates the problem. At the whirlpool also, in the rear of the escarpment, some friction must have been developed by the gradual loosening of the *débris* that filled the ancient channel. As this

passed down stream it added its influence to the destruction of the barrier. This must have been small; but it helped, and the net result in the end was a hastening of the destruction of the escarpment. The gorge below the whirlpool was thus gradually formed and as it neared completion the lower falls began to disappear, the gorge above them began to be drained, and the present falls began to assume their modern form, or to resume their ancient one. Erosion at their location was then restored to its former potency and began to go on as of yore.

Just where the upper falls were situated, when the lower ones gradually ceased to be, is not clear; but it is evident that they must have been further up-stream than they were at the time the old channel was obstructed. They were then plainly at, or above, the whirlpool rapids; for, otherwise, there could have been no ancient gorge to be filled with glacial *débris* at a point just beyond. This part of the escarpment had been eroded in past ages; but the cut was now blocked effectually with material left by the ice. The river was thus forced to provide itself with a new channel, and it did so, taking a course approximately at right angles to its former one. This would seem to indicate that either the glacial deposit at this point was once much greater than it is at present and that the new channel was first opened through the loose surface material left by the ice, or else that the initial deposit was reinforced by some other means. Both contingencies may be true; but, in either case, glacial *débris* probably did its part as a scouring agent in the process of eroding the escarpment. That such material greatly hastened the completion of the channel-cutting below the point of obstruction can hardly be doubted; for it must have been carried into the stream in vast quantities for many years. In this respect the history of the Niagara

gorge strongly resembles that already outlined for the Mississippi one, and their beginnings were doubtless parallel also.

It must now be clear that some allowance will need to be made for these other factors, if the rate of erosion at Niagara Falls is to serve as a basis for computing time since the Glacial Epoch. And with them must be placed the element of comparative width, which has already been referred to in this connection. In turning from the falls to look at the gorge below, almost any one would be struck with the remarkable contraction which it shows in the matter of the relative width of the falls and the lower rapids. Some allowance must be made for the slope in the banks and for the shelf that runs along the American side; but after this has been done the gorge is still far narrower than the river above the falls is, to say nothing of the perimeter of the falls themselves. They doubtless had a horseshoe shape from the start; but even with that concession, they would have to be moved but a scant half mile down stream to be greatly contracted in extent, as compared with their present dimensions. Except at the whirlpool itself, the gorge remains comparatively narrow throughout its entire length.[1]

The conclusion is obvious. The ancient falls were much restricted in width, if the modern ones are made the standard. And if the amount of water was anything like the present supply, the erosion was perhaps twice as great as it is in our day, since approximately double the amount now going over the brink at any given spot would have to be accommodated at the place corresponding to it, unless the level of the lakes was lowered. The water supply could therefore be greatly dimin-

[1] See Cent. Dict., vol. x. map 13. The contrast there shown far exceeds anything here claimed; but the channel is mapped, not the gorge. Erosion on the Canadian side has long exceeded that on the American side, and the effect of this must be allowed for.

ished without reducing the rate of erosion that is commonly used in these time calculations, and this diminished supply could continue for the greater part of the entire period without making it longer than the time now estimated. As the precipitation was undoubtedly greater than it is at present, during a part of the time, and there is no likelihood that it was ever less, it follows that the period allowed for erosion is too long to accord with the facts. It should therefore be shortened, although there is danger of going to the other extreme and concluding that the time has been much shorter than it has in reality.

The probabilities are that the actual location of the ancient falls at the time the river was dammed was at or very near the spot now occupied by the whirlpool; for it seems likely that the *débris* would choke the gorge for its entire length. For this reason, no deduction can be made in the length of the gorge to be eroded; and it will not do to allow too much for the erosive action above the lower cataract during the period of its existence. At the beginning, this action must have been very slight indeed, although the time came when it counted for something in the aggregate. It was intensified as the lower channel deepened; but this must have been an extremely slow process, and it is likely that some diminution would occur in the rate of erosion produced by the lower falls as they diminished in height.

These are small factors; but they affect final results, and they must therefore be considered. Possible differences in methods of drainage should also be allowed for, since there may have been slight changes of elevation accompanied by temporary diversions of the waters of the lakes [1] during the period under discussion. The remarkable resistance shown by the

[1] Cf. Scientific Confirmations of Old Testament History, p. 402.

débris at the whirlpool rapids argues that some other obstacle may have been met with at this point by the river, when it was seeking an outlet for its empounded waters. The edge of a field of ice would furnish such an obstacle, and it would make the sudden turning of the river easily comprehensible; but an explanation of that character projects the erosion backward into the Ice Age, unless it is assumed that some fortuitous berg was stranded at this point by the retiring flood and left to waste away by degrees. Such an event was a possible, but it was not a probable, cause of the river's action; and, if there was no ice, there was probably a greater accumulation of *débris*, which has been gradually reduced to its present amount.

The river, then, on such a basis, must have first plowed its way through loose material, which served the purpose of hastening the formation of a channel in the ledge, when once the earth had been washed away and the grinding that results from rocks and gravel in a stream had been made possible. This would be likely to shorten the period required; but the presence of ice might do the same, since more or less of the same material would still be available. If glacial ice is insisted on, the erosion began before the time assigned, and the date of the deluge must be made more modern to correspond therewith. In all this there is scant comfort for those geologists who would project the Glacial Epoch backward to an era many thousands of years ago.

Climatic changes always lag behind their causes. The coldest weather of the northern winter is apt to occur some weeks later than the winter solstice, when the sun is growing warmer with the lengthening of the days. In like manner, the greatest heat of the summer months is wont to be felt when the days have grown perceptibly shorter. It therefore seems likely that

the full effect of the reversal of the present relations of Perihelion and Aphelion, which took place something over ten millenniums ago, was not felt for several centuries in the Northern Hemisphere, with which the argument has especially to do. But if this is so, it took a long time for the winters to attain to their maximum length and a longer one for the accumulations of ice and snow — made possible by the enveloping clouds and the chilling summer fogs that prevented their destruction — to reach their maximum extent. That event, therefore, can hardly be placed earlier than the year 8000 B.C.

Then came the prolonged struggle between the snow and the sun, as the cloud caps shrunk in extent and the sun shone in his strength during the short Perihelion summers; for they only occupied the time taken in traversing one end of the earth's elliptical orbit. The wavering glaciation, with its alternately advancing and retreating ice fields was the result; but the glaciation persisted and even increased at its main centers, until the ice was pressed outward in all directions with increasing speed and sufficient force to move great boulders long distances and produce the other well-known effects that now disclose its history. Mighty lakes, some of which were due to ice dams, furnished a broad expanse at the southern limits of the glaciated areas, from which to replenish by evaporation the nimbus clouds as fast as they were dispersed in the form of rain. Fog, too, did its part, as it does to-day in the Perihelion summers of Antarctic regions, where zero weather in mid-summer is no novelty.

Conditions like these would be likely to persist, until some force that was capable of destroying such enormous glaciers in their entirety made its appearance; and it may be inferred that they did persist for ages, or until the resisting power of the continents was overcome by the enormous pressure of the

concentrated glacial ice, now a mile or two in depth over a large part of the affected areas. Submergence followed, and submergence is an adequate cause for the effects produced. No other adequate cause has been suggested, and no other need be looked for, since it is not probable that any other can ever be found. When the time was ripe, the lands sank under their burden, the ice was destroyed, its place was taken by broad temperate regions bathed in sunlight, and a new era was begun — an era in which men might attain to their greatest and best development. In that era we are living, and it has not been unduly long.

Geologists have been led to infer that vast changes took place in the glaciated areas and that these must have required untold thousands of years; but nature is not always uniform in her methods of procedure, as recent earthquakes testify. She can and does act suddenly at times, and she did so when the ice had accomplished its purpose. That the changes were great in the interim in the limits of glaciation, there can be no question in the face of the evidence adduced; but, when the surprising alterations that have taken place in the Muir Glacier within the past century are considered,[1] the doctrine that such variations in extent and contour require unlimited time, becomes extremely doubtful, to say the least. Attention has already been called to the fact that Astronomy forbids any such teaching,— it does so on the basis of known rates of cooling,— and it may therefore be assumed that four thousand years is ample time for the changes warranted by the evidence.

This would place the flood at about 4000 B.C., a date with which Chinese tradition is said to be in harmony.[2] At that

[1] See Records of the Past, vol. viii. pp. 113 ff.

[2] See Urquhart's New Biblical Guide, vol. i. p. 272. It is worthy of note that in this tradition Fuh-he escapes with his three sons and three daughters, while the rest of the human race perishes. This

time writing was certainly known and a high civilization prevailed both in Babylonia and Egypt. It is not unlikely that similar conditions were to be found in China also and possibly elsewhere; for recent discoveries in the caves of France would seem to indicate a great antiquity for the art of weaving and a hitherto unsuspected amount of progress on the part of Palaeolithic man.[1] The construction of the ark was therefore well within the bounds of possibility, and this part of the Bible narrative is no myth.

Dates in the early history of ancient nations are still uncertain; but evidence of a decided break in the continuity of their rulers and of the people also, for that matter, before the dawn of reliable history, is not lacking, in more instances than one. Somewhere in the neighborhood of 4000 B.C. it now appears likely that the flood occurred; for at about that time all the intricate conditions in which the event is enmeshed seem possible of fulfilment. The Chinese tradition may therefore be correct, and the Assyrian records may be right in referring to sacred documents or rather inscriptions of a contemporary date. If they are, it is no mere coincidence that the Genesis account of the deluge reads like the tale of an eye-witness; for Noah may have kept a record, and this may have been religiously preserved for many generations, until it came into the hands of Ruel, the priest of Midian, who was a descendant of Abraham, and whose daughter Zipporah became Moses' wife.[2] Through her the story may have come into his possession and been given its present literary form. More re-

looks like the story of Noah in Chinese garb, and it may be that it is: for the Chinese may have received the tale at a very early period when it was still possible to place the date with approximate accuracy, and they may have preserved it with characteristic fidelity.

[1] See Bibliotheca Sacra, vol. lxiv. pp. 526 f.

[2] See Gen. xxv. 2; 1 Chron. i. 32; and Ex. ii. 16–22.

markable things have happened, and truth is ever stranger than fiction.

A word further should be said of the climatic changes, mentioned above, as an accompaniment of the altered conditions due to the flood. The submerged areas rose again, but they never attained to their old-time level. These portions of the continents remained comparatively low, and corresponding portions of the oceanic islands and of the ocean floor remained comparatively high, the net result being a higher general sea level and a lower general altitude of the land. Continental areas were thus reduced, while sea areas were greatly extended, as has been stated; but at this point another element appears. In calculating the power of the tidal waves which constituted the main features of the flood, allowance had to be made for the molten lava, boiling mud, and superheated steam, that were forced into the ocean from beneath it, in the course of the cataclysm. Vast quantities of heat were absorbed therefrom by the waters of the sea; but the melting ice took care of most of it in the aftermath, and a balance was thus struck which served to equalize climatic conditions everywhere. The results attained have persisted, and man has been the gainer.

It must not be supposed that these effects took place immediately; for they did not. Much of the glacial ice was speedily melted; but many huge bergs and extensive floes were left, because they were too large to yield at once to the destructive agencies, great as those were which assailed them. Some were undoubtedly swept out to sea, where they continued to drift for many decades after the ebb and flow of the flood had ceased; but in time they completely disappeared. More were probably stranded on the land and left there to slowly melt away. To such floes as these may possibly be attributed many

of the strange and puzzling geological combinations that have long baffled the ingenuity of scientists in the efforts they have made to explain them. The floes, if they were the agency used, certainly served their purpose well in mixing various elements of a diverse character. They also affected the climate and delayed the final triumph of the sun.

Backward springs, tardy summers, fields of ice that lasted far longer than they should on the surface of the vast inland lakes, ice dams in the fastnesses of the mountains that refused to yield,— some of them lasted for years because of the protecting silt washed over them,— temporary lakes due to these dams, and probably other similar results, were all the indirect outcome of the presence of these stranded masses of ice in various extended areas. In time these also disappeared, and modern conditions began to prevail. Looked at from this side, 4000 B.C. again seems like a probable date for the end of the Ice Age. The earth had now shifted its position so that Perihelion and Aphelion were beginning to occupy the months between the winter and summer seasons, and in the Northern Hemisphere, as well as in the Southern, the spring and fall were the parts of the year most affected, the one season being shortened somewhat and the other lengthened. If the flood occurred under these conditions, they were certainly favorable for an outcome like that which must have taken place.

As to the repeopling of the Euphrates valley and the neighboring lands, it will need but a few figures to show that a scant four hundred years would be sufficient to provide a population of over four million persons, if, starting with Noah's family of eight and excluding all other possible sources of supply, the number of people in the world were to double itself but once in twenty years, a thing which was certainly possible in

those early days of large families and long-lived men. But if the population doubled itself only once in thirty-three years, the lapse of five centuries must have produced over one hundred thousand souls. Under favorable conditions, it may have been able in those days to double itself as often as once in ten years; and, on that basis, less than a century and three quarters would be sufficient to produce over half a million people. Such possibilities, to say nothing of the world's experience during the past five hundred years, should give pause to the men who so readily postulate "eons of time" for past eras and events. The truth is that "the imagination is a forward delusive faculty ever obtruding beyond its sphere." It should be held in check, unless it is supported by reliable data or known facts.

Time has not been limitless, so far as this present world is concerned, and it will not be. The brief and temporary character of all things mundane must be conceded, in the light of what has been discovered, and it behooves us to be modest in our estimates of past ages. The flood, therefore, was not so remote an event as some would have us believe, nor yet was it so recent as many have taught. The well-known habit of Orientals of leaving out unimportant generations and counting descendants as sons, was common among the Hebrews, as unmistakable examples in the historical records of the Bible testify. No dependence can be placed, therefore, on Ussher's chronology.[1] It is entirely unreliable, and the date of the flood must be obtained in other ways, if it is obtained at all.

[1] **See Wright, Scientific Confirmations of Old Testament History, pp. 189 ff., or Bibliotheca Sacra, vol. lix. 288 ff. The Aryans had this habit, and the ramifications of meaning embodied in the etymological relatives of the English word "nepotism" bear witness to the fact.**

It remains to mention certain other features, particularly some connected with the inland seas and lakes which may have been affected by the breaking up of the ice pack or the submergence of the continents. That extensive areas of North America were flooded long after the disappearance of the ice has already been stated. This is conceded by all, and its effects have been fairly well agreed upon. Like conditions must have obtained elsewhere, notably in Asia, the gradual desiccation of a large section of which is reflected in the Vedic literature. That many of these ancient lake beds have been found to contain salt deposits at their bottom may be explained by the admixture of sea water due to the deluge, and the influence of the melting ice may be traced in the relative proportions of the salt in different basins. Concentration gradually led to saline lakes of a smaller size; then came ponds; then, salt marshes; and finally deposits of salt. The Aral Sea has remained in a condition resembling that of these ancient lakes; but the Caspian seems to have received additional accretions of salt during the high water stage of the oceans, when it was directly connected with the Mediterranean *via* the Black Sea.[1] Neither sea is very saline; and it has been

[1] The high water of those post-glacial days may have another possible tale to tell; for, as was suggested in the London Times of February 19, 1909, the remarkable discoveries recently made in Crete may point to the lost Atlantis so graphically pictured in Plato's Timaeus. The topography and political requirements seem to be fulfilled by this ancient kingdom, and the evidences of its undoing are still plainly traceable. The story of the priest of Sais, according to which Athens conquered Atlantis only to be overwhelmed with it by the encroaching sea, may come nearer to fact than to fiction, provided it can be shown that ancient geographical ideas were somewhat confused with reference to the location of the Pillars of Hercules. This is not impossible. As to the mud banks dangerous to ships, which resulted from the overwhelming of Atlantis, it may be, as has been suggested, that they confused the Syrtes with the lost country; but it seems more likely that there

inferred that neither has been long enough enclosed to gather and concentrate a great amount of salt, as the Dead Sea and Great Salt Lake are supposed to have done. The ordinary assumption is that they have accumulated salt with the help of the streams flowing into them; but a different hypothesis will be offered below. It will not be any harder to believe than is the present remarkable theory.

Lake Baikal is of importance; for it shows signs of some recent great upheaval, or some mighty earth movement, such as has been postulated as one of the incidents of the flood. Its enormous chasm may have been affected in some way at the time of that event; and, if it was, its remarkable depth may be due to some readjustment of land surfaces which allowed its bottom to settle below its ancient level. Such glacial *débris* as may have existed in that cold and forbidding region may thus have been swallowed up in the depths of the lake, leaving no traces behind it to tell the story.

While it had no glacial elements to contend with, the Dead Sea may have resembled Lake Baikal in other respects so far as its genesis is concerned. It lies in an earthquake region which has suffered extensively in the past, and it occupies the lowest part of a great cleft, a thousand miles or more in length, which is plainly the result of some convulsion of nature. Its greatest depth is about thirteen hundred feet, while the greatest depth of Lake Baikal is more than four thousand; but its area is small in comparison with Lake Baikal's four

may have been such places in the lower parts of Crete, when the sea level was at its maximum height of possibly two hundred and fifty feet above tide water as the ocean is at present. It appears to be safe to assume, as has been done, that the power of the supposed fabled land may have greatly exalted the ideas of other nations with respect to its size, and that feature of the tale may therefore be less important than it looks.

hundred miles of length and thirty miles of width. On neither has the silt of modern ages made any apparent impression; and either their original depth must have been excessively great or else the clefts which they occupy are geologically very recent. As was implied above, this may point to changes in them at the time of the flood, and it may even indicate that that event was not very remote.

Lake Baikal has an outlet to the sea, and its waters are fresh. The Dead Sea is land-locked and exceedingly salt. It seems likely that this feature is in part the result of a gradual concentration of the vast quantity of salt water that must have been left by the flood in the great cleft of which the Dead Sea is a portion; for there are evidences that this cleft was once filled with water to the brim. If the Dead Sea really is the residuum of such an inheritance from the flood, its saline character is not hard to understand, and the salt bluffs on its eastern shore seem less remarkable. On any other basis, the presence of so much salt, apparently crystallized out of the sea itself, is not easy of comprehension. Some salt has undoubtedly been contributed by drainage; but the proportion must be very small and hardly worth considering, unless natural salt deposits not due to the presence of sea water have added their quota to the sum total through some agency in the past. The salt impregnated sands of the shores are not to be overlooked, and they point in the direction indicated above.[1]

[1] It may be possible that the rock salt of the bluffs had some other origin than that usually supposed and that it furnished the source of supply for the sea instead of being derived from its waters. The latter contingency, however, remains, — attractive as the former supposition plainly is, though where else the salt could come from is a puzzle. If it was there before the flood, the sand and gravel overlying it may go back to that event and not be the result of excessive rains. See below. Also Wright, Scientific Aspects of Christian Evidences, p. 126.

A similar solution may be postulated for our own Great Salt Lake; for it may be but the impounded dregs of the huge tidal wave that must have invaded this part of the great western plains from the south, filling the basin of the Salton Sea and covering everything but the mountains with water. There could have been no admixture of ice until the northern limits of the plains were reached. There the ice was encountered, and the water was therefore freshened. At the close of the disturbance, an immense body of water was left, with a shore line nearly a thousand feet above the present level of Great Salt Lake. It included Lake Sevier, which is also salt. Fresh water shells are found along this shore line; but the water was probably brackish and therefore sufficiently saline to account for the present character of the lake.[1]

As to the cause of the ocean's saltness, it seems absurd to suppose that the rivers have washed enough salt into the sea to furnish its supply. Ocean areas far exceed those of the land, and the rivers cover but an insignificant fraction of the latter's surface. If they can find salt to wash into the sea, is it reasonable to suppose that the ocean can find none beyond what they contribute? Mines of rock salt hard enough to permit beautiful grottoes to be carved out of the salt itself are found in Europe, and other salt mines occur elsewhere. It is therefore hardly to be supposed that the entire ocean floor escaped all such formations. But if it did not, the river theory falls to the ground. So does the absurd notion that the ocean began as fresh water. It began as hot water; but wherever

[1] It may not be without significance that a salt mine in Southern Louisiana, discovered in 1861 beneath a drift mass sixteen feet or more in depth, was found to contain fossil remains of human beings, mastodons, mammoths, etc., together with pottery and stone implements. Here, again, both men and animals seem to have been overtaken by a common catastrophe.

sodium chloride came into existence in forming the earth's crust, there any contact with hot water, be it rain or running stream or stagnant pool or extensive sheet, meant a saline solution. Condensation after saturation meant crystallization, and many of the present salt formations undoubtedly had such an origin; but at the beginning of things at the time when chemical compounds were just coming into existence it is clear that some other process must have been available. Otherwise there would have been no salt. It is accordingly safe to infer that the ocean, on the basis of comparative opportunity, is not indebted to the rivers for its salt. The chances are thousands to one against such a contingency, and the ocean has probably been in contact with salt, either formed or forming, from the start, for such chemical compounds must have occurred in the very beginning.

It was postulated that the ocean was at a low level during the Ice Age, or at the beginning of the Quaternary Period when man was created. The Euphrates valley must therefore have been much higher, relatively speaking, than it is to-day, and the river must have flowed through a fertile plain where the Persian Gulf now lies. This plain may have been the Eden of Genesis, and its climate may have been ideal. It is now a region of excessive heat; but the change of relative levels, the sea being possibly seven hundred feet below its modern stage, because of depletions and a less uneven bed, with the protecting clouds, must have tempered the heat materially.

With the flood, the whole situation was changed. The level of the sea was greatly raised, and it continued for ages much higher than its modern norm. The lower part of the Euphrates valley was therefore flooded, and the Tigris and its sister stream were thus enabled to enter the Persian Gulf by sep-

arate mouths. This condition prevailed up to what may now be called historic times. Ur of the Chaldees, when Abram left it at about 2150 B.C., is said to have been a maritime city with a harbor and docks. Its location is now approximately a hundred and fifty miles inland. Silting up has gone on beneath the waves, the silt has been heaped up more or less by them, and accretions have been added from other sources; but, unless the land itself has been elevated, which is a remote contingency, the ocean must have been lowered to account for the facts. It is possible that both things have happened; but the chances are with the latter probability. These considerations furnish another strong presumptive argument for the accuracy of the hypothesis already outlined.

Changes of ocean level have certainly occurred, and there has been a reason for them. But if the causes that were operative during the Quaternary Period have been correctly outlined, it will hardly be possible to place the beginning of present high water conditions much earlier than about two thousand years before Abraham's day. The margin allowed by this period is ample apparently, and concessions could as well be made by reducing the time as by increasing it. Excavations at Nippur have disclosed extensive accumulations of *débris* antedating Sargon I., whose date was 3800 B.C. These deposits may have been a by-product of the flood. If they were, they are significant.

Much remains to be learned concerning the deluge; but the conviction is growing that a world catastrophe lies back of Noah's story.[1] His tale, despite its strange incidents and ap-

[1] Those who are not accustomed to think clearly or to differentiate things that are associated but not alike, may find it hard to entertain the idea that the flood itself, though practically universal is not so described in the book of Genesis. Such persons fail to see, however, the difficulties besetting any other conclusion. Did Moses

parent defiance of natural law, is an accurate and vivid portrayal of actual events. No man would or could imagine such things with no experience to suggest them; and it is contrary to human nature to insert such details in a perfectly sober narrative, unless the truth demands it. Irrespective of the fact, then, that the account is found in the most remarkable and most trustworthy book of the ages, it is safe to infer that Noah had the experiences set forth in the Bible story. Truth is proverbially stranger than fiction, and he told things as they actually happened.[1]

understand modern Geography? If he did not, how could he have included the entire world in his story? If he did so, the Bible is in conflict with some of the facts, and its veracity is impugned. Does such a condition tally with inspiration? Which horn of the dilemma shall be taken? A man ignorant of Geology might so describe certain fossil remains that a geologist would recognize them as the head and neck bones of an antediluvian Brontosaurus, a hideous creature resembling a sort of elephant with anterior and posterior elongations suggestive of the fabled sea serpent. He would view the fossils accordingly; but his informant would almost certainly describe them as the remains of a huge snake, though he might be accurate in his account of the bones as far as he went. It would be unreasonable to ask for more. Is it reasonable to make unnecessary demands on the extent of Moses' knowledge or on the doctrine of inspiration or on the completeness of a revelation for which there was no practical need?

[1] A slight error was made at the start in outlining the problem; for "highest mountains" should read, hills and mountains (third page top).