

## **The Ice Age Catastrophe that Submerged Much of the World**

**By Nigel Blair**

### ***The New Earth Sciences and the Three Great Floods***

As Lord Kelvin stated "*There is nothing in Science which teaches the origin of anything at all.*" Yet we live in an age where everything seems to be fully explored and explained. Science, we are often told, has reached to the ends of the Earth; the stars in the heavens are measured and fully accounted for, and even the planet's history going back 4.5 billion years has been, so the story goes, minutely traced and analyzed. Precious little of the fundamental outline, we are confidently told by certain of the mainstream academics, remains questionable; details these authorities say need to be filled out. The "Proud Tower" of western science has mastered nature. It is triumphant, having driven all before it. It no longer fears any foes. It rests secure on a magnificent platform of achievement and present recognition. Or does it?

At the same time as we are being presented with this formidable front, the cracks in it are becoming increasingly hard to conceal. An enormous range of anomalies silently challenge the official scenario in countless subjects. The standard laws of physics appear to be transcended by the findings not only of paranormal researchers but of astrophysicists, mathematicians and philosophers. The theory of evolution in its mainstream form, apparently rock-solid for well over a century, now turns out to have been ignoring a whole series of gaps in the-fossil record and other inconsistencies and is being seriously modified by a major new scenario known as the theory of punctuated equilibrium. This has sparked off a furious academic debate which is unlikely to be resolved in the near future. It maintains that the fossil gaps are no accident, but that the process of evolution itself occurs in short sharp bursts, with long periods of stability in between, rather than a gradual smooth continuum as used to be thought.

This in turn is linked to a marked renewal in the theory of catastrophism, or the occurrence of periodic cataclysms in Earth's history, which could have triggered these bursts of evolutionary development. And here is another field where the orthodox view, widely known in this case as geological uniformitarianism", is being vigorously challenged. It assumes, as with evolution, that Earth's development has been a smooth, basically uninterrupted progress. But there was never positive evidence for this view. It was simply an assumption based on the tendency of the human mind to fill gaps in the record with the simplest and least convoluted scenario, as when one joins up the points in a graph with straight lines in the absence of intervening points of reference. These "lines in the graph" have seemed to be secure for decades, but now a whole hornet's nest has been stirred up by the fact that researchers are finding further points of reference. What they indicate is dramatic. There certainly were great and sudden global catastrophes at various points in the planet's long history, and at least one or two of these came perilously near to extinguishing complex life on Earth altogether.

### ***Catastrophism, Rising Sea-Levels and Submerged Lands***

*"A dramatic example of the new, sharper resolution the [Greenland] ice cores are yielding comes at the close of the Younger Dry as, a 1,300- year cold snap..... falling between 12,900 and 11,600 years ago. it was the last swing back to glacial cold - a drop of 7°C in Greenland -*

*after the climate had already started warming..... At the end of the Younger Dry as, the climate jumped back toward the relative warmth of the past 10,000 years — and that last leap out of the ice age was a humdinger, according to the latest analyses of ice cores. Alley and 10 U.S. colleagues... reported last month that at the end of the Younger Dry as, a warmer, wetter climate doubled the rate of snow accumulation in only 3 years. Most of the increase occurred in a single year."<sup>1</sup>*

This article conveys a strong sense of the excitement caused as the early results of the Greenland ice-cores came in, radically changing the picture of the end of the last Ice Age from the long-held "uniformitarian" idea of a gradual warming and melting to a very different concept of "stunningly abrupt climate shifts". The find reported above, in particular, was a dramatic confirmation of the pioneering work of Professor Emiliani and his team at Miami University some two decades earlier. This is true of the date (c. 9,600 BC), the extent, and the suddenness of the sea-level rise, which immediately followed the equally rapid global warming which ended the last Ice Age. They are all substantially consistent with Emiliani's calculations based on his quite different Gulf of Mexico research.

Catastrophism has now extended into studies of the more recent geologic past, especially the period surrounding the end of the last Ice Age, from about 16,000 to 5,000 BC. Amongst other things according to the faithful record of air pockets preserved in the Greenland ice-cores, these upheavals in turn caused worldwide volcanic eruptions on a scale unprecedented during the previous hundred thousand years. They brought about, directly or indirectly, the extinction of many species of large animals — some seventy or more in America alone, including the mammoth and the sabre-toothed tiger.

These global upheavals polluted the atmosphere with all sorts of dust and chemicals, causing a "greenhouse effect" and a series of rapid massive global warmings, which despite two major re-freezings ultimately became permanent. They melted much of the polar ice-caps and thereby raised the planetary sea-level dramatically — now known to be ultimately by between 400 and 500 feet. As we will see shortly, this was enormously more than was thought half a century or so ago. It submerged whole vast areas of the world's continents and a large number of islands in the Atlantic and elsewhere.

Any underwater area 400-500 feet or less in depth is practically certain to have been above the surface up to, and possibly after, the beginning of the end of the last Ice Age. The end of the Ice Age can be, for all practical purposes, dated to 12,000-5,000 BC. The first gradual beginnings of ice melting began in about 18-16,000 BC, when worldwide sea-levels were roughly 120-150 metres (394-492 feet) below those we have today. The range of figures is caused by the margin of error in calculations, and by rises and falls in the levels of the adjacent coastlines in various parts of the world - against which the regional sea-levels are measured.

The ending of the Ice Age was, however, a slow process before about 12,000 BC. Until very recently, many experts assumed, in the absence of evidence to the contrary, that it remained a gradual, smooth process throughout. One often still sees it stated as a fact today. This is the picture that tended to emerge from the standard textbooks - those, that is, which covered the question at all. This is not to criticize them: one cannot reasonably do other than assume

a continuum if one has no hard facts with which to construct any other, more detailed scenario.

There has not yet been time for the newly-discovered information to percolate through to many of the textbooks — which have a notoriously long time-lag for updating - and therefore to a large number of other books and articles, popular and otherwise, that are based on them. One suspects, too, that its implications have not yet fully been faced up to by many of the academic departments of universities.

The story of the disproof of this comfortable scenario is essentially that of the destruction of a modern scientific myth - the myth of "uniformitarianism" as applied to the end of the last Ice Age, going back to Agassiz and Professor Charles Lyell in the 19th Century. For in the 1990s, the picture has been totally transformed by that "Rosetta Stone" of climatic history, the ice-cores now being regularly extracted from the Greenland ice-sheet by a distinguished team of international scientists. These cores contain in abundance, in trapped air pockets, a highly detailed record of past climate change going back, by now, at least 250,000 years.

As far as temperature is concerned, for example, they show a truly dramatic scenario of large numbers of jagged "peaks and troughs" in the graph, depicting rapid global warmings and then re-freezings on a continuous intermittent basis throughout the last Ice Age, until the last major re-warming occurred around 8,000 BC. After this, the Earth's temperature stabilized at a level around 4-5 degrees Celsius - a massive leap - and has, with lesser variations, remained at this warmer point ever since.

The most startling findings related to the end of the Ice Age, i.e. the melting of the polar and sub-polar ice-sheets. These show up in the Greenland ice-cores as occurring not smoothly, as had been assumed, but in three great sudden bursts, the causes of which are still controversial. The first of these three massive accelerated meltings of polar ice occurred around 12,000 BC. And it is to these newly-discovered dramatic episodes in Earth's history that we must now turn.

### ***The Three Great Floods: Around 12,000, 9,500 AND 5.500BC***

*"Elevations and ages of drowned Acropora Palmata reefs from the Caribbean-Atlantic region document three catastrophic, metre-scale sea-level-rise events during the last deglaciation. These catastrophic rises were synchronous with (1) collapse of the Laurentide and Antarctic ice sheets, (2) dramatic reorganization of ocean-atmosphere circulation, and (3) releases of huge volumes of subglacial and proglacial meltwater. This correlation suggests that release of stored meltwater periodically destabilized ice sheets, causing them to collapse and send huge fleets of icebergs into the Atlantic. Massive inputs of ice not only produced catastrophic sea-level rise, drowning reefs and destabilizing other ice sheets, but also rapidly reduced the elevation of the Laurentide ice sheet, flipping atmospheric circulation patterns and forcing warm equatorial waters into the frigid North Atlantic. Such dramatic evidence of catastrophic climate and sea-level change during deglaciation has potentially disastrous implications/or the future, especially as the stability of remaining ice sheets — such as in west Antarctica — is in question."*<sup>2</sup>

Their work has become well-known amongst scientists as pioneering the discovery of the three great worldwide floods. As far as the greatest of these floods (c. 9,600 BC) was concerned, it confirmed the earlier work of Professor Emiliani and his University of Miami team, as well as the early Greenland ice-core research. Its main interest lies in the fact that it also detected two other great floods, those of around 12,000 and 5,500 BC. It is cited by Stephen Oppenheimer in his "Eden in the East".

In about 12,000 BC, for whatever reason, a sudden major global warming took place; large amounts of North American ice, especially from Lake Livingstone, broke away into the North Atlantic and melted into it, probably taking huge amounts of other ice with it, and raising the sea-level to around 80 metres (262 feet) of the present level.

After this sudden warming and melting, the Ice Age temporarily returned with a severe "cold snap", named the "Younger Dryas" event after the Arctic wildflower "Dryas Octopetala", which proliferates in extremely cold weather. The sea-level rise returned to a very gradual, long-term phase, and may even have stopped or been reversed.

In around 9,500 BC - almost precisely Plato's date - there was another rapid global warming, taking place in the remarkably short time of fifty years, which has been detected by tracing trapped marsh gas, or methane, in Greenland ice-cores. Again, vast amounts of ice broke away, especially from the Baltic and the enormous Laurentide ice-sheet in northeast Canada, and floated into the North Sea and the North Atlantic in a succession of icebergs which then melted. This was probably the largest and most dramatic sea-level rise of all.

As a result, within the amazingly short time of under 160 years from about 9,500 BC, sea-level is thought to have risen to just under 50 metres (164 feet) of today's level, from the roughly 80 metres that it had been before. Any areas of sea-floor currently less than 80 metres (262 feet) in depth, even where no sea-bed subsidence has occurred, are therefore likely to have been dry land up to a little after Plato's famous date (literally 9,571 BC) for the submergence of Atlantis. At this point, those regions now between 80 and 50 metres deep would have been submerged.

In practice many sea-floor regions at greater depths than this, especially on the Mid-Atlantic Ridge, would also probably have been land before and possibly after this point, because of sea-floor subsidence, partly caused by the great weight of extra water on the thin oceanic crust, that has since submerged them.

Any present-day submerged regions which are less than 50 metres deep are not likely to have been submerged in around 9,500 BC, but would probably have remained above the surface for several thousand years after that, during which the ice-melting and sea-level rise again slowed right down. In fact, although Oppenheimer does not mention it, there was a third brief re-freezing from about 8,730 BC when Canadian Lake Agassiz broke through the ice barrier and discharged large amounts of icebergs and freezing water into the North Atlantic. Before this could raise the sea-level significantly, it temporarily almost stopped the "Atlantic conveyor" or warm water current to the north, and caused a mini-Ice Age. This was reversed through a re-warming by about 8,000 BC. It was enough almost to stop the ice-melting for a few centuries.

Present sea-floor areas that had survived the 9,500 BC flood and remained as dry land were however, unless they are now very shallow, destined to go under by about 5,000 BC. This is because there was a third great worldwide flood in 6,000-5,500 BC. Stephen Oppenheimer, in "Eden in the East", describes how there are various estimates of the extent of this, but the overall picture is of an extremely rapid sea-level rise of possibly 25 metres (82 feet), to a point very little short of today's level. Again the cause was principally the breaking up of vast ice-sheets in Canada.

By this time, nearly all of the world's enormous continental shelves, mainly land during the last Ice Age, would have become submerged ocean floor. The same applies to a great many islands in the Atlantic and other oceans, while island-groups like the Azores, Canaries and Madeiras preserved only remnants of their former extent. So, for the first time, we can speak of the lost continental shelves and islands of Atlantis.

The catastrophic and sudden nature of these three great periods of ice-sheet break-ups and sea-level rises, however, is still as we saw, a discovery that is relatively recent. As such, its startling implications for the history of early advanced humanity are very far from having been thought through. Many mainstream scholars may be none too keen to do this, consciously or unconsciously. It will mean re-writing many textbook passages. In some cases, it will mean sacrificing some "sacred cows" — not the least of these being that of "uniformitarianism" — and instead accepting at least elements of their polar opposites — in this case "catastrophism".

### ***A Knife-Edge World: Is Our 10,000-Year Respite Over?***

The discovery of the "Atlantic conveyor" and its dramatic effects on climate, have totally transformed our understanding of the Earth's past. It has, in just the last few years, made the gradualist hypothesis of our planetary climate in its pure form completely untenable. In its place we have, in the detailed graphs of the ice-cores and biological specimens, the jagged peaks and troughs of a very different story.

It is a tale of violent and sometimes catastrophic climate changes taking place in as little as five years at a time; of massive and sudden warmings and re-freezings of as much as ten to twenty degrees Celsius in as little time; of dramatic breakthroughs of vast masses of freezing water into the Atlantic, causing worldwide floods; of the most concentrated series of volcanic eruptions worldwide of the last 100,000 years.

In other words, it is the story of a world teetering from catastrophe to catastrophe, with just small changes in ocean currents tipping the balance; of a world on a knife-edge, with minute differences in one area making the difference between, for example, a continued global warming and a sudden plunge into a new mini-Ice Age.

During the last 10,000 years, humanity has been (by some extraordinary dispensation) spared this violent environment. World temperatures have remained stable at a warm, yet temperate level. We have used this respite to build (or perhaps rebuild) a great worldwide civilization. But one of the messages of this new "Atlantic conveyor" research is that this

beneficent climate could change at any time. And, what is more, our present activities are encouraging it to do so.

### ***The Invisible Current Which Switched Off: Could It Do So Again?***

With our current massive industrial pollution of the worldwide atmosphere, we are mortgaging our own future. By sending masses of "greenhouse gases" like carbon dioxide and sulphur dioxide into the atmosphere, it is now almost generally accepted by world scientists that we are building up a "greenhouse effect".

This, so it seems, will warm up the planet. This in itself has dire consequences, including the imminent melting of more ice and a further worldwide rise in sea-level, flooding lowlands everywhere and practically submerging a number of low-lying islands and plains. But at least, one might say, we are avoiding the threat of a new Ice Age. Or are we?

For, by one of the greatest climatological paradoxes of our time, a warming, by melting vast masses of sub-Arctic ice, may dilute the "Atlantic conveyor" warm water current which at present keeps the northern Atlantic latitudes temperate. Dilution may switch it off and if such a thing is possible, it could have happened to at least some degree, in about 8,760 BC and about 11,000 BC. Both these events plunged the world back into a new mini-Ice Age. Could it happen again? Yes. This is exactly why world scientists are so concerned with studying our late Ice Age past and it is to the key to this dramatic and violent past (nothing less than the history of the last great climatological catastrophe on Planet Earth) that we must now turn.

This key can be found in something whose presence was not even suspected a few years ago. It is sometimes known as "The Stream in the Dark", sometimes as the "Atlantic conveyor", more often loosely as the Gulfstream — though it is not the same as that friendly and apparently reliable Gulfstream which we have always known. It is something truly hidden, powerful, unpredictable and extremely inaccessible. Which is why, despite its crucial importance for the planet, it has only just been detected, by scientists who risked their very reputations to do so. It makes a fascinating story, which we must now tell.

*"The time of 11,600 years B.P., when the influx of Laurentide ice meltwater into the Gulf of Mexico was highest, coincides in age with the Valders re-advance [of the ice-sheet in North America]. This 150-kilometre re-advance was, therefore, a surge... which led to strong ablation [melting, erosion] and the observed high concentration of ice meltwater in the Gulf of Mexico. The concomitant, accelerated rise in [worldwide] sea level, of the order of decimetres [tens of metres] per year, must have caused widespread flooding of low-lying areas, many of which were inhabited by man. We submit that this event, in spite of its great antiquity in cultural terms, could be an explanation for the deluge stories common to many Eurasian, Australasian, and American traditions. Plato (Tmaeus, Critias) set the date of the flood at 9,000 years before Solon, equal to 9,600 years B.C. or 11,600 years B.P. This date coincides, within all limits of error, with the age of both the highest concentration of ice meltwater in the Gulf of Mexico and the Valders re-advance."<sup>3</sup>*

### ***Older Explanations of the End of the Last Ice Age: Superseded by New Ice-Core Evidence***

*"It would be too simplistic to explain the flood myths away simply on the basis that the sea rose as the last Ice Age came to an end and that Stone Age people recorded the events in their folk stories. Sea-levels are certainly 120-130 metres higher than they were 20,000 years ago at the height of the last Ice Age, but 20,000 years is a long time for such an event to take place. If the inundation had happened gradually and smoothly over that time, then no one would have noticed. But it did not happen that way and people did notice. As we have just seen, the ice melted in a jerky way. Much of the ice of the polar caps thawed in three great gushes of meltwater into the North Atlantic...."*<sup>4</sup>

*".....At first I didn't quite believe that these big climate jumps had happened, but the records of the ice-cores [revealing the story told by the ancient frozen snow] and the records from many other places say that these big climate jumps (did happen; and they happened in many places and they were large and they were fast and they happened all over the world....."*<sup>5</sup>

*"If... Atlantis... [and the land-bridge connecting Europe and Greenland via Iceland] had not sunken and the Gulf Stream thus had been unable to enter the Arctic Ocean and melt the solid frozen Barent Sea, then extensive inland ice-sheets would still cover Northern Europe and Canada. Arctic tundra conditions would still prevail....."*<sup>6</sup>

Until just a few years ago, ideas of what might have caused the apparent great catastrophe of the melting of the polar and sub-polar ice-sheets were plentiful, but highly speculative and uncertain. For, by the second half of the 20<sup>th</sup> Century, it had become clear that this melting occurred remarkably quickly, although just how quickly had to wait for the Greenland ice-core results of the 1990s.

It was also just beginning to become evident that the global warming and consequent ice melting occurred not smoothly, but in fits and starts, with at least two major reversions to mini Ice Ages before the warmer epoch really took hold. After that - from around 8,000 BC - what is called the "inter-glacial" or warm era between Ice Ages (for another is expected in a few thousand years) became stable, and indeed is still with us.

What was the hidden factor which caused the initial global warming in the first place, that started the ice-sheets melting, at first gradually, from about 16,000 BC? What, subsequently, caused the accelerated warming, melting and therefore sea-level rise (the first Great Flood) from around 12,000 BC? What suddenly aborted and reversed this in about 11,000 BC, causing a very severe mini-Ice Age - the so-called "Younger Dryas" event which lasted until around 9,600 BC?

What then, crucially, caused the extraordinarily rapid melting and rise in worldwide sea-levels (the second Great Flood) of some 100 feet within 160 years of that date - Plato's date for the submergence of Atlantis? What caused yet another sudden re-freezing and re-warming in the next millennium, between about 8,760 and 8,000 BC? And what, some 2,000 years later, caused a further rise in sea-level (the third Great Flood) in 6,000-5,500 BC?

The mainstream oceanographers were at a loss to explain this tentatively emerging picture, and mostly avoided facing up to it, continuing to fight a losing battle to retain the increasingly illusory "uniformitarian" thesis of a smooth, steady sea-level rise over many millennia.

For that, the so-called Milankovitch hypothesis, ascribing the end of the last Ice Age to marginal and gradual changes in the Earth's angles of interaction with the sun, seemed to be an adequate explanation, and right up to the end of the century textbooks continued to offer this as the complete or predominant cause.

Enthusiasts for a large Mid-Atlantic Ridge Atlantis island or continent, like Nikolai Zhirov, Rene Malaise or Otto Muck, writing between around 1950 and 1975, believed they had the answer. In common with certain other scientists - notably Russian - they believed that this landmass had been enough to block the warm Gulfstream current from reaching Northern Europe and the Arctic, as Malaise argues in our above quotation.

They thought - not unreasonably in view of the lack of any other adequate explanation at the time - that its more or less sudden disappearance, in the epoch that marked the end of the last Ice Age, had had dramatic consequences. It had transformed the entire planet. It had freed the Gulfstream to reach the north, causing in turn the global warming, the ice-sheet melting, and the rise in sea-level: in short, the end of the Ice Age.

Unfortunately for these traditional Atlantologists, ongoing scientific research was already not bearing out their ingenious hypothesis. Firstly, the whole geological and oceanographical basis for a Mid-Atlantic Ridge island big enough to obstruct the Gulfstream was being undermined from the 1950s onwards by new and revolutionary research into the nature of the Atlantic sea-bed rocks, and into continental drift, "sea-floor spreading" and the behaviour of tectonic plates.

But this was not all. Like the orthodox oceanographers of the time, the Atlantic-centred Atlantologists understandably failed to anticipate the sheer climatic razor-edge abruptness, repetitiveness and complexity of the picture that was to emerge from the ice-core, coral reef, island coastline, sea-bed and other research of the 1980s and 90s.

Even if there had been a large mid-Atlantic island, and it had suddenly disappeared in, say, 9,600 BC as Plato (taken very literally) said — releasing the Gulfstream to the north — this could only have explained one such release. The island, incidentally, would have had to have been well to the north of the position Plato gave it (opposite the Straits of Gibraltar) to have had this effect, but let us leave this aside for the moment.

The crucial point is that, even if parts of the mid-Atlantic island had remained, they would have been inadequate to continue to provide any sort of barrier to the Gulfstream on its way north after its initial supposed submergence. This hypothesis, therefore, could not even begin to explain the picture of repeated warmings and re-freezings that emerged by the end of the century. And it certainly could not offer any sort of explanation of the frequent sudden shifts that the ice-cores, as we will see shortly, show had been occurring for at least 100,000 years - i.e., for countless millennia before the end of the last Ice Age.



So, by around the mid-1990s, we were faced with an enigmatic puzzle. The new ice-core and other evidence showing the jagged graphs of incredibly sudden warmings and re-freezings was emerging, yet there seemed to be no-one on either side of the Atlantis or catastrophist controversies who could offer any convincing reasons for it. Or was there?

### ***Of Frozen Snow, Ice-Cores and Sudden Climate Shifts***

*"Most of the things [at the end of the last Ice Age] we measure happened in about five years — the snowfall doubled in three years and about nine-tenths of that change was in a single year. The temperature change was sort of a decade or faster... fast... this is not your lifetime, this is not even a single human generation, it's shorter than that"*<sup>7</sup>

On 18th August 1999, a remarkable documentary programme, "The Stream in the Dark", was shown on the "Discovery" Channel of Sky TV, in the excellent "Planet Ocean" series 15. Very shortly afterward, BBC-2 TV devoted an entire evening on 30th August to what they called "Hot and Cold Night" - a series of programmes covering the Earth's climate and its dramatic effects, past and present. The fourth of these, "The Big Chill", lived up to its somewhat daunting title. Mainly concerned with whether the world's northern latitudes — notably Britain — is heading for another mini-Ice Age in possibly as little as the next hundred years (a question which it left unresolved), it sketched a most extraordinary story going back to the end of the last Ice Age.

Taken together, these two documentaries gave most of the British, and presumably western, public its first introduction to a whole set of brand-new evidence, previously available almost entirely in specialist books and articles. The story, essentially, is one of three scientists, each of them following up a series of minute clues in the 1990s, defying the predominant orthodoxy, sticking to their guns against initial almost universal scepticism.

"The Big Chill" started the story as far back as thirty years ago when the first of these three, the Englishman Professor Russell Coope, started digging in the mud of the eroding cliffs of north-west England. An expert in beetles, he found to his astonishment that the arrangement of their remains in the soil layers of the end of the last Ice Age defied the "uniformitarian" orthodoxy of the supposed smooth passage from a freezing cold to a warmer climate. This view would have resulted in the cold-loving beetles being in the lower, earlier levels, with the warmth-loving species gradually taking over as the higher, later levels were examined.

In fact, the position was reversed so completely that, for a long time, he thought he must have accidentally transposed his samples. But he had not done so. In fact, the apparently incredible picture revealed by his beetles was true. The climate had changed, not gradually, but to and fro between cold and warm in a series of abrupt steps, each taking less than a human lifetime.

At the time, nobody believed Russell Coope's thesis. It flew in the face of practically all the established, "uniformitarian" opinion. Its adoption would require the re-writing of most of the textbooks. Climate change at this speed, the experts said, simply could not happen.

One of the reasons for this was that for several decades, alterations in the climate had been measured by drilling into the sea-bed and examining minute foraminifera, or forams, tiny sea-creatures. They gave the scientists a picture of gradual, smooth climate change, revealed by changes in the make-up of their shells.

In the course of the last million years, according to this scenario, enormous ice-sheets had gradually expanded across the northern and southern parts of the Earth, and then retreated, ten times. There seemed to be a stately and gentle rhythm, with no sudden or catastrophic changes.

The changes that did happen were all ascribed to the so-called Milankovitch hypothesis — the marginal and very slow changes in the Earth's angle of rotation in relation to the sun. These are known to exist, but affect the planet's temperature by only a very few percentage points, and only in cycles lasting between 100,000 and 20,000 years.

But one scientist in particular saw the fatal flaw in this neat, "uniformitarian" picture. Richard Alley was suspicious of the all too convenient mainstream view. He realized that the ocean floor mud from which the foraminifera were taken was deposited at such a slow rate that the best measurements could only depict changes taking several hundred years.

There might be all sorts of changes occurring over shorter time-spans than this, but they would be completely undetected by the officially-favoured methods.

There needed to be some material which could fix a "memory" of much shorter periods. Alley realized that "frozen snow", in other words an ice-sheet, would do this, since cores of ice display layers-that correspond to single years. So in 1989 he joined the international scientific project to drill through the Greenland ice-sheet, the biggest remnant on land of the last Ice Age, where snow has been falling and being compacted into ice for hundreds of thousands of years. At its thickest, it is over three kilometres.

Alley set out to find out about the last Ice Age in more detail than ever before. He and his team produced the longest ever ice-core, going back well over 100,000 years. After years of research, the result was quite astonishing, and completely overturned the orthodox "uniformitarian" view.

When the evidence had been put together into one massive graph, the picture was dramatically clear. Every few thousand years, the temperature fluctuated by twenty degrees Celsius or more - truly enormous compared with the one to three degrees increase that we are currently worrying about possibly occurring in the next century or so.

For the end of the last Ice Age, the scenario was particularly stark. After an initial global warming, most marked from about 13,000 BC, there had been a very sudden, stepped re-freezing into a new mini-Ice Age from about 11,000 BC. After 1,200 years of intense cold, there was an equally rapid re-warming.

This, of course, as we see elsewhere, led to a further period of polar warming and melting. Other research has now decisively shown that vast quantities of water poured into the oceans

in about 9,600-9,400 BC, starting at almost exactly Plato's date, raising worldwide sea-levels by some 100 feet in what had been previously thought the impossibly short time of 160 years, flooding many islands and coastal plains.

What had set off these dramatic climatic changes? The story of how ocean currents played a dramatic part in this, which we must now consider, is even more extraordinary than that of the ice-cores.

### ***"The Stream in the Dark": The Amazing Story of the "Atlantic Conveyor"***

*"The vast amount of fresh water that flooded out from the [ancient Canadian] lake spread out [in c. 11,000 BC] over the entire North Atlantic region, lowering the salinity of the sea-water.*

*The lower salinity rapidly weakened the sinking water. As a result, the entire oceanic conveyor belt came to a stop....*

*.....With the conveyor coming to a halt, large regions of the Earth were hit by severe cold, rather like a return to the Ice Age. It's believed that in some places the temperature dropped over 10 degrees in 20 to 30 years. This sudden and drastic climate change was to prove a serious problem to ancestral men, who were spread out around the globe."<sup>8</sup>*

The breakthrough here was due to the equally pioneering work of another highly individual scientist. Professor Wallace ("Wally") Broecker, of Lamont Doherty Earth Observatory, Columbia University, New York, is now well-known for his work with the "Hydrosphere II" experiment which isolated a number of human volunteers in a controlled atmosphere inside a specially-built transparent complex.

But his greatest achievement is undoubtedly the discovery of what is now known as the "Atlantic conveyor". This has brought about no less than a complete revolution in our understanding of the Earth's climate.

Broecker is both an oceanographer and a geologist. He knew that the so-called Milankovitch effect could not possibly bring about the rapid changes revealed by the Greenland ice-cores. But, in a sudden flash of insight, he realized that the oceans, which he had been studying on research ships since the 1970s, held the answer.

Wally already knew about the Gulfstream, which brings warm water from the Gulf of Mexico up to north-west Europe and the Arctic, thus ensuring that the British Isles, for example, are far warmer than Labrador, which is roughly the same latitude. But he suddenly realized that the Gulfstream might be connected to a deeper ocean current which could be compared to a submerged conveyor belt. Wally gave this the brilliant title of "Atlantic conveyor". He pointed out that it transports a vast amount of water, equivalent to all the rainfall in the world, or 70-80 rivers the size of the mighty Amazon. More importantly, its contribution to the warmth of Europe is truly immense - about 30, equivalent to the output from a million power stations.

"The Big Chill" makes it dramatically clear what would happen in the near future if the "Atlantic conveyor" switched off. The temperature of Europe, and the British Isles in particular, would plunge downward dramatically. We would be in the throes of a new mini-Ice Age. Once it switched on again, there would be an equally rapid re-warming. In other

words, just exactly what, according to the ice-cores, happened throughout much of the last Ice Age, and particularly in its final phase.

But what could possibly cause these dramatic switching's on and off of the "Atlantic conveyor"? This part of the puzzle was relatively easy. It had been known for some time that the water of the warm Atlantic current, when it reaches sub-Arctic latitudes, is cooled by the Arctic winds, gets more dense, and sinks. In a process called convection, it drags the rest of the current northward. This sinking process in the extreme north of the Atlantic is the engine that drives the whole of the worldwide deep ocean current system stretching right into the Pacific, of which the "Atlantic conveyor" is only a part.

This whole system acts as a temperature regulator of the Earth, and has kept its climate moderately warm and temperate for some 10,000 years. It has, in fact, made possible nothing less than the birth, perhaps rebirth, of advanced civilization. But it has a fatal flaw at certain crucial points. We must now examine just what this was.

### ***Catastrophe: A Great Prehistoric Flood Switches off the Conveyor***

*"The outflow [of fresh water from the great prehistoric Canadian lake, about 11,000 BC] was enormous, it was catastrophic... it was able to flood the North Atlantic with fresh water in a very short time. It then lowered the salinity of the waters in the North Atlantic to the point where the conveyor could no longer operate. The North Atlantic deep water could no longer form, and the conveyor came to a stop.....*

*.....The flow of warm water to the north that replaced the water that was sinking stopped, and therefore conditions could get much colder. It was not just a smooth transition from operating in state A to operating in state B, but the system flickered; it sort of went on and off in a sort of chaotic way."<sup>9</sup>*

If fresh water (especially cold fresh water from newly melted ice-sheets or icebergs) floods across the surface of the ocean diluting the salt water of the warm water current, its saltiness (hence its density) and its temperature are reduced to the point where it is no longer heavy enough to sink. The crucial current switches off.

At first, the mainstream of science, as often happens with new ideas, could not stomach Wally Broecker's thesis. It took some five years of resistance and disbelief before it was accepted. One of the decisive breakthroughs in countering this opposition was when Wally found a time in the Earth's history when the "Atlantic conveyor" did, indeed, switch off. The time he chose was central to our theme in this book. It was none other than the end of the last Ice Age, about 11,000 BC.

At this point, a great global warming was in full swing, and ice-sheets were melting in many places. One of these created a truly enormous lake straddling what is now the United States and Canada, equal in size to several large American states. It was trapped by a dam of ice. When this suddenly broke, it released enormous amounts of fresh water through the St. Lawrence Seaway directly into the path of the "Atlantic conveyor", stopping its' convection engine abruptly and thus switching it off.

The result was a new mini-Ice Age lasting well over a millennium, known in the textbooks as the "Younger Dryas" event, as the hardy Dryas flower flourished in the Arctic during this time. It was, if anything, even colder than the latter stages of the Ice Age proper. It was some 1,200 years before the "Atlantic conveyor" was to switch on again. This was at least part of the cause of the second great global warming and sea-level rise of c. 9,600 BC.

Wally Broecker went on to argue that a similar process had occurred throughout the last Ice Age, at least partly explaining the jagged graph showing innumerable sudden warmings and coolings over about the last 100,000 years. On these occasions, Broecker stated, an initial global warming must have caused ice-sheets to melt, releasing vast armadas of icebergs into the Atlantic, thus switching off the "Atlantic conveyor" and rapidly bringing about a subsequent re-freezing.

So the Earth's climate history of the last hundred millennia or so seems to have been drastically influenced by the two states of the warm ocean current, "on" and "off". There are also several other likely causes of the drastic climate changes of the end of the last Ice Age, including possible bombardments or dust envelopments from space. At the present time Nibiru (the 12<sup>th</sup> planet is passing through our solar system. Could this be a catalyst for sudden planetary and climatic upheaval during the next year or two?

At the very least, Wally Broecker has given us a major part of the explanation. There is no doubt that his research, like that of Richard Alley and others on the Greenland ice-cores, has been brilliant in conception and well backed by experimental evidence and other research. During the 1990s, as the importance of his breakthrough began finally to be realized, he was showered with honours, including for example the U.S. National Medal of Science, 1996; given for his "pioneering contributions to understanding of the circulation of the oceans, global-carbon cycle, and the record of global climate changes". And, interestingly, it puts the story of the oceans, particularly the Atlantic, right in the centre of the history of Planet Earth. One thing is certain. "The Stream in the Dark", as it has been called, has been until the 1990s one of the most secret of all parts of "The Secret Story of Our Planet".

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