

THE GILGAMESH GENE

Robin Russell-Jones



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Time Line

- 10,000 BC End of the Ice Age
Start of the Neolithic period (New Stone Age)
- 9000 BC World population ca 7 million.
Dawn of agriculture
- 4,500 BC Start of the Copper Age
- 3900 BC The 5.9 kiloyear event causes drought and desertification
Civilisation concentrates along the Tigris-Euphrates rivers
- 3600 BC Start of the Uruk expansion
- 3000 BC Start of the Bronze Age and cuneiform writing
- 2750 BC Reign of Gilgamesh, King of Uruk
World population ca 45 million
- 2500 BC Construction of the Great Pyramid at Giza
- 2400 BC Blue stones are moved from the Presceli mountains to Stonehenge
The world's first empire established by King Akkad (2334-2279 BC)
- 2150 BC Fall of the Akkadian Empire, and the Old Kingdom of Egypt.
Sumerian resurgence under King Shulgi (2094-2047 BC)
The earliest poems about Gilgamesh (Bilgames in Sumerian)
- 1900 BC Start of the Babylonian Empire (1894 BC)
- 1800 BC Babylonians record different versions of the Flood Story including
the old Sumerian legend of King Ziusudra and the Epic of Atrahasis
First account of the *Epic of Gilgamesh* (The Old Babylonian version)

- 1750 BC Death of King Hammurabi
End of the Old Babylonian Empire
Abraham leaves the city of Ur, former capital of Sumer
- 1600 BC Exodus of the Israelites from Egypt
Volcanic eruption on Santorini (Minoan city of Thera)
- 1200 BC Tribes of Israel decimated by the Assyrians.
The standard version of the Epic of Gilgamesh
Start of the Iron Age
- 900 BC Reign of King Solomon (ca 970-931 BC)
Start of the Neo-Assyrian Empire (911-612 BC)
- 700 BC Royal library at Nineveh under King Ashurbanipal (668-627 BC)
- 600 BC Start of the Chaldean (Neo-Babylonian) Empire (626-539 BC)
Jerusalem conquered by the Chaldeans in 597 BC and sacked in 587 BC
Temple of Solomon razed to the ground
Jews held captive in Babylon under King Nebuchadnezzar.
First version of the Bible.
- 550 BC Zoroastrian religion adopted by the Achaemenid Empire (550-330 BC)
- 500 BC Jewish Temple rebuilt (516 BC)
Death of the Buddha (486 BC)
- 330 BC Alexandra the Great sacks Persepolis, capital of the Achaemenid Empire
- 240 BC Eratosthenes calculates the circumference of the earth
- 200 BC First Chinese Emperor (Qin Dynasty 221-206 BC)
Jewish scholars translate the Bible into Greek (The Septuagint)
- 20 BC King Herod renovates the Temple in Jerusalem
World Population ca 200 million
- AD Jesus dies (ca 33 AD):
Romans destroy Jewish Temple (70 AD)
Siege of Massada
Rise of Christianity

TIME LINE

- 600 Life of Muhammad (570-632 AD): Rise of Islam
- 950 Vikings colonise Greenland
- 1700 Sea levels reliably recorded
- 1750 Start of the industrial revolution
Levels of atmospheric CO₂: 280 parts per million
- 1800 Henry Cavendish calculates the mass of the earth
World population reaches 1 billion
- 1850 World temperatures reliably recorded
- 1953 Clair Patterson dates the age of the earth
- 1960 World population reaches 3 billion
- 1983 Discovery of the ozone hole over Antarctica
- 2000 The term “Anthropocene” used by Paul Krutzen
- 2011 World population reaches 7 billion
- 2013 CO₂ reaches 400 parts per million.
- 2015 The Paris Agreement limits global warming to 2°C with a target of 1.5°C
- 2016 World temperatures reach 1.1°C above base-line
Arctic temperatures 3.0°C above base-line

Prologue

The title of this book, *The Gilgamesh Gene*, is the result of a long quest: I felt the need to write a book about the man-made processes that threaten our environment and particularly about the dangers of unchecked global warming. I had it in my head that people would understand the science if only it was explained clearly enough – and if they understood the science then they would automatically change their ways. In medicine, this is called a delusion.

In reality, what I was really after was not a book about climate change, because plenty have been written already. I felt a compulsion to write a book about the human condition, and in particular how it is that mankind has brought itself to the brink of extinction, along with most other species on Earth. Ultimately, it is a question about human psychology. What was it that initially separated us from other primates? What was different about *Homo sapiens* 30,000 years ago that predicated our survival and the demise of our closest rivals, the Neanderthals? Why are we obsessed with the notion that GDP is the only possible definition of progress? If we are able to predict our own demise, why can we not do anything to stop it? That is what this book is about, but it employs the oldest story comprehensively recorded by human civilisation to inform the debate: the Epic of Gilgamesh. He was a king from Sumer in Ancient Mesopotamia, who ruled the city state of Uruk around 2750 BC, and it is his exploits that provide the blue-print for much of our self-destructive behaviour today.

This is not the way that devotees and scholars like to think about Gilgamesh, as the Epic contains many mystical elements, including dream analysis, and is suffused with words of wisdom much of which ended up in Eastern religions. However, Gilgamesh was not the sort of guy you would want your daughter to marry. He was a tyrannical, cruel and lustful king, not unlike Henry VIII. He demanded first refusal on a bride's wedding night and dispatched husbands elsewhere if he enjoyed the experience. Ultimately he was an egomaniac, with an inflated opinion of his own importance who embarked on projects that would enhance his reputation, like building palaces made of cedar wood. Like all egoists (think Putin or Trump), he did everything to excess and cared little for the consequences of his own actions.

The central theme of the Epic is ecological. Gilgamesh and his alter ego Enkidu set off to slay Humbaba the fire-breathing monster who guards the cedar forests. There are two separate versions of the Epic dating from the

second millennium BC, both written in Akkadian, but there are earlier poems written in Sumerian dating from the third millennium BC where Gilgamesh is called Bilgames, and Humbaba is called Huwawa. According to the Epic, Humbaba's role as guardian of a natural resource has been ordained by Enlil who is the god of punishment and dwells on Earth. Undaunted our two heroes overcome the monster, Gilgamesh cuts off his head, and they float down the Euphrates on a raft of cedar logs with Gilgamesh holding the head of Humbaba as proof of his prowess, like a modern-day trophy hunter. Gilgamesh was a real king, but how much of the Epic is based on real events?

If we consider the earliest account of Gilgamesh's visit to the cedar forest, the poem 'Bilgames and Huwawa' written in Sumerian around 2,100 BC, we are told that our hero had to cross seven mountain ranges before he found the cedars that were big enough for his purposes, and according to the Standard Version of the Epic (1200 BC), Gilgamesh opened the mountain passes and dug wells on the slopes. These details denote authentic historical events.

When Huwawa tells Bilgames to go home, our hero offers him friendship and his sisters in matrimony plus a list of luxury items to persuade "the monster" to relinquish more of his trees: fine flour, cool water, big sandals for big feet, and little sandals for little feet, rather like sailors from whaling ships bargaining with South sea islanders in the 19th century. Thus the earliest account of the meeting between Bilgames and Huwawa indicates that the original Humbaba was not a monster but a forest guardian in human form, probably a wild hermit, quite possibly a bit crazy. Furthermore each enticement is followed by Huwawa handing over one of his seven auras, which in the poem is envisaged as another great cedar tree. The last three auras are exchanged for three precious rocks, chalcedony, rock crystal and lapis lazuli. After that Enkidu persuades Bilgames to take Huwawa captive, and when Huwawa protests it is Enkidu who decapitates him, not Bilgames. His head is brought to the God Enlil in a leather bag, but Enlil is furious and chastises our two heroes:

"Why have you done this thing?
Was it commanded that his name should be wiped from the earth?
He should have sat before you,
He should have eaten the bread that you ate,
He should have drunk the water that you drank,
He should have been treated in the proper way"¹

In other words he should have been treated with courtesy and respect, not bribed, double-crossed and then murdered. With this poem, treachery had

1 George, Andrew, *The Epic of Gilgamesh*, Penguin Classics, 1999.

entered the human condition, and the natural world, in the shape of forests, became something that man could barter and exploit. At the same time the ancient chroniclers appreciated that vainglorious kings such as Gilgamesh posed a danger to peaceful co-existence, so when they came to write the Epic, they included philosophical advice to restrict the ambition of megalomaniacs.

The city of Uruk where Gilgamesh reigned was located on the banks of the Euphrates in the third millennium BC, but today lies neglected, if not forgotten, in the sands of Southern Iraq, the area that corresponds to Ancient Sumer. Because the Sumerians developed the first known form of cuneiform writing, and recorded their transactions and, later, poems on clay tablets, we have an unrivalled historical record dating back 5000 years and three separate versions of the Gilgamesh story – much of it safely stored in the British Museum.

The original Sumerian poems were written down more than two centuries after Ancient Sumeria had been conquered by the Akkadians from the North of Iraq. The king who conquered Uruk and united the two cultures to form the world's first Empire was Sargon of Akkad (reigned 2334-2279 BC). The result was a bi-lingual civilisation in which both Sumerian and Akkadian were employed, even though Sumerian is a language isolate with no known antecedents, whilst Akkadian is a Semitic language. The Akkadian empire began to founder around 2150 BC, and this was followed by a brief period of Sumerian resurgence.

Ur became the capital of Mesopotamia, and Sumerian literature enjoyed a brief period of renaissance under the rule of King Shulgi (2094-2047 BC) who had been trained both as a scribe and a warrior. It is likely that King Shulgi or his predecessors wanted to record the oral tradition of Ancient Sumer while they still had the opportunity; so they recorded “Bilgames and the Aga”, “Bilgames and Huwawa”, “Bilgames and the Bull of Heaven”, “Bilgames and the Netherworld” and “the Death of Bilgames”.

However the Sumerian renaissance did not last long. Babylon was founded in 1894 BC by West Semitic Amorites, and by the time King Hammurabi had died in 1750 BC, he had brought all of Mesopotamia under Babylonian rule. However, things fell apart pretty quickly after his death. There was a period of severe instability leading up to 1595 BC, when Babylon was taken over by people from the Zagros Mountains in western Iran. The Sumerian language only survived thanks to the scribal traditions of Babylonia and as incantations used in Babylonian temples.

Although the five poems about Bilgames form the basis for the later epic, they are not formulated as a continuous narrative. The first exposition of the epic itself appeared during the first half of the second millennium BC, but its authorship is unknown. It is written in Akkadian and is known as the Old Babylonian Version, because at the time Babylonian was an Akkadian dialect. Eleven fragments of the Old Babylonian version exist in museums in different

parts of the world, but only three tablets are more or less complete. This version of the Epic was known in antiquity by its opening line, 'Surpassing all other kings', and is usually dated to the eighteenth century BC.

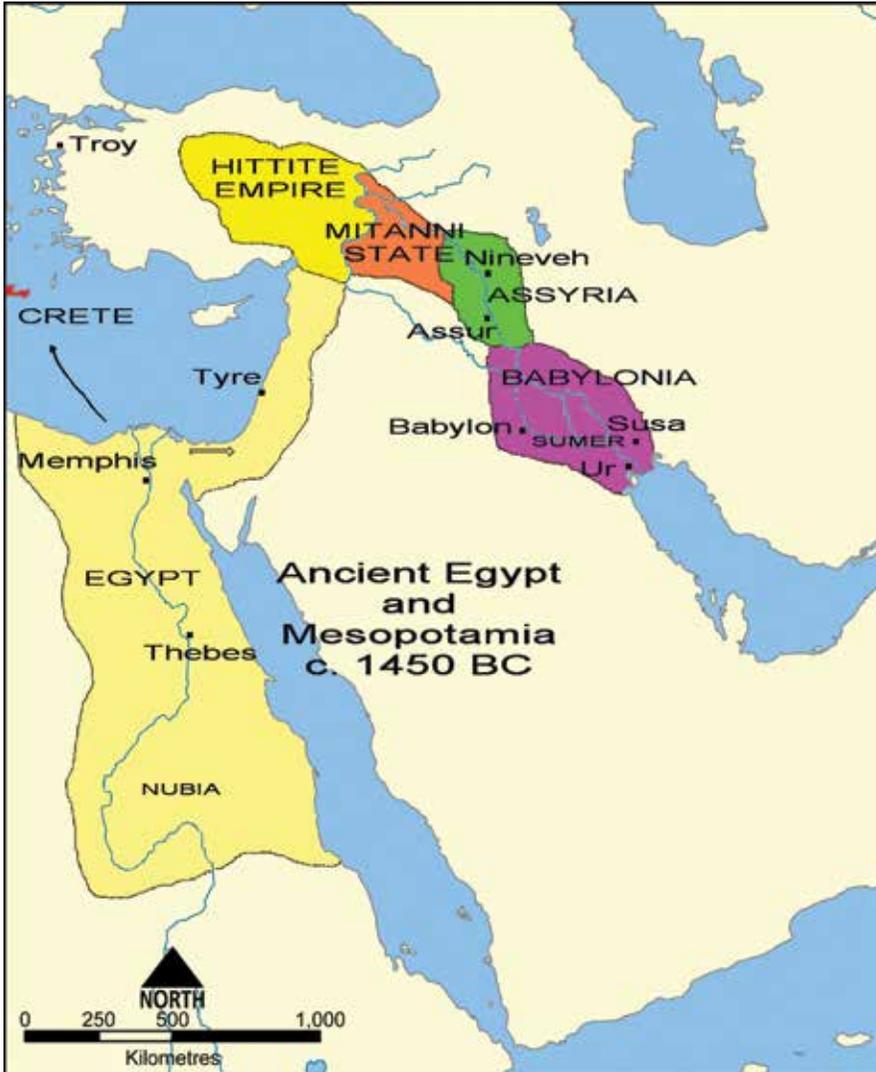
By this time, the old Akkadian Empire had split into Babylonia to the south and Assyria to the north, but Akkadian was to survive as the lingua franca of the day. Thus, when the kings of Assyria or Babylonia wrote to an Egyptian pharaoh, they wrote in Akkadian, and the pharaoh replied in Akkadian.

500 years after the Old Babylonian Version, the Standard Version first appeared, written by a scholar/priest, Sin-leqi-unninni, and this forms the basis for most modern accounts, including the magical translation by Stephen Mitchell. Sin-leqi-unninni translates as: 'O moon-god – accept my prayer' ('Sin' being the Akkadian name for the Sumerian moon-god, Nanna). Sin-leqi-unninni lived between 1300 BC and 1100 BC, and is supposed to have been an incantation priest/exorcist who tended to the sick and dying.

The Standard Version, also known as 'He who saw the Deep', as it contains an account of Gilgamesh's visit to the underworld, consists of twelve tablets, of which the most complete rendering was found in the Library of the Assyrian King, Ashurbanipal (668-627 BC), in Nineveh (modern-day Mosul in northern Iraq). However, the scribal tradition in ancient Babylonia resulted in numerous incomplete copies, which have been recovered from other locations – within Babylonia, Assyria and further afield.

So far, 73 tablets have been unearthed, of which 35 were discovered at Nineveh, 8 from other Assyrian cities, and 30 from Babylonia (mainly Uruk and Babylon itself). Of the 3000 lines of text, approximately one third is indecipherable and 575 are missing altogether. Crucially there is a gap in Tablet II of the Standard Version, the point at which Gilgamesh suddenly decides, without preamble or explanation, that he has to set off with Enkidu to slay the fire-breathing monster that guards the cedar forest.

Where parts of the Epic exist in both versions, it is clear that the Standard Version adheres closely to its predecessor. Some parts of the Epic are decipherable only in the Old Babylonian Version and these have been used to fill in the lacunae in the Standard Version. The main divergences appear to be the prologue, added by Sin-leqi-unninni; the speech by the priestess/courtesan, Shamhat, persuading Enkidu to give up his animalistic existence in the forest and follow her to Uruk, the pinnacle of civilisation; and some pearls of wisdom that in the Old Babylonian Version are offered by a minor goddess of wisdom, Shiduri, which do not appear in the Standard Version. Instead philosophical commentary is reserved for Utnapishtim, the precursor of Noah, who is described in the Epic as "the distant one" and resides at the source of the rivers, having been granted immortality by the Gods for having saved the human race from the flood. Stephen Mitchell translates Shiduri's guidance as follows:



Overview of the Ancient Near East in the 15th century BC. The Fertile Crescent extends from Ur in Southern Babylonia through Assyria, Mitanni and Hatti before turning South through modern-day Lebanon and Israel to Egypt.

‘Gilgamesh, where are you roaming?
 You will never find the eternal life
 that you seek. When the gods created mankind,
 they also created death, and they held back
 eternal life for themselves alone.’²

By contrast, Tablet X of the Standard Version ends with these words of wisdom from Utnapishtim:

The Anunnaki, the great gods, held an assembly,
 Mammitum, maker of destiny, fixed fates with them:
 Both death and life they have established,
 But the day of Death they do not disclose.³

Tablet X1 of the Standard Version contains a complete account of the story of the Flood as narrated by Utnapishtim, but there is no equivalent account in the Old Babylonian version from the eighteenth century BC. Instead we have two other accounts of the Deluge: the Sumerian Flood story which features King Ziusudra, and another in Akkadian, the Atrahasis Epic, both dating from the early part of the second millennium BC and therefore contemporaneous with the Old Babylonian Version of the Gilgamesh Epic. According to modern scholarship (See *The Ark before Noah* by Irvine Finkel), the inclusion of the flood narrative in the Standard Version of the Epic of Gilgamesh may have occurred as late as the seventh century BC. In any event, all versions would have been available to Jewish scholars when they were held in captivity by King Nebuchadnezzar in Babylon during the sixth century BC. This may explain the remarkable similarities between Tablet X1 of the Gilgamesh Epic and the Genesis version of the Deluge.

Twelve was a significant number in Ancient Mesopotamia, and formed the basis of their numbering and accounting systems – which comprised 1, 12, 60 and 60 x 60, (ie 3,600). The Standard Version of the Epic is written on twelve tablets, even though Tablet XII is the Sumerian poem, ‘Bilgames and the Netherworld’, translated into Akkadian and seemingly unconnected to the main narrative. The Standard Version begins with a prologue written by Sin-leqi-unninni. According to this prologue, the original Epic was written on lapis lazuli, and secreted in a copper box under the cornerstone of Uruk.

Lapis lazuli is a vivid blue, and was greatly prized in the ancient world as it was the only material available to depict the supreme deity An, God of the

2 Mitchell, Stephen, *Gilgamesh*, Profile Books, 2004.

3 George, Andrew, *ibid.*

Sky. It was therefore reserved for matters of great importance. Thus, in the book of Exodus, the original version of the “ten” commandments was also written on lapis lazuli. These commandments were smashed to pieces on Mount Sinai by Moses after the flight from Egypt. Moses then produced a new version carved in stone, the ten commandments of biblical fame, but there are different versions of this story in different religious traditions which can be formulated to create any number of commandments up to 13. It is likely that the original commandments on lapis lazuli numbered 12, as this corresponds with the numerology employed in Ancient Sumer and Babylonia, but there is no evidence to confirm this.

There are many gods in the Sumerian pantheon, but three in particular are featured in the Old Babylonian Version of the Epic: An, known as Anu in Akkadian, Enlil who resides on Earth and becomes the god of Punishment, and Enki (Ea in Akkadian) who resides in the Absu, the mythical underground ocean from which fresh water springs. Enki is the god of intellect and wisdom, but also the god of rivers and of water, the source of life in Ancient Mesopotamia. It is he who sends the seven sages to Eridu and other Sumerian cities in order to teach mankind the skills necessary for a civilised society.

In the Epic, Utnapishtim (Noah) was reportedly the King of another Sumerian city located on the Euphrates, Shuruppak (modern-day Tell Fara). In the Sumerian Flood story King Ziusudra is supposed to be the son of King Shuruppak and the two names, Ziusudra and Utnapishtim both translate as “He of long life”, so the two accounts, separated by a millennium are closely related. The Jewish covenant was between the God of wisdom, Enki in Sumerian, Ea in Akkadian and Yah in Hebrew, who is then chosen by the Israelites to become the one true God, Yah-weh, the God of the Old Testament – ‘weh’ meaning good. The covenant between Yahweh and the Israelites is formed because Ea warns Utnapishtim about the coming flood, and when he survives, Ea persuades the God of Punishment Enlil, not to kill Utnapishtim and his family for the sins of the many.

In the Bible we are told that the Deluge was a punishment for mankind’s wicked ways, but sin is not mentioned by Utnapishtim as a rationale for the flood. Instead, the Old Babylonian account of the flood, the legend of Atrahasis, blames the clamour made by the human race; in other words overpopulation. In this legend Enlil, the God of Punishment sends plague drought and famine in order to reduce human numbers, but these prove unsuccessful. His final solution is the Deluge. The climax of the legend of Atrahasis is that some women choose to become chaste, but the larger dimension is that still birth, infertility and mortality are ordained by the Gods to prevent human numbers spiralling out of control.

Polytheistic religions have no problem accounting for the vicissitudes of life, as different gods can be made responsible for different events such as drought, plague, and famine, or personal tragedies such as death, still-birth and disease. A monotheistic God has to cover all eventualities, so Yahweh should be viewed as combining features of the three Akkadian gods, Anu, Enlil and Ea. Unfortunately, when Moses came to rewrite the Ten Commandments, there is a lot about Yahweh being the one true god, and the first five books of the Old Testament (the Torah) contain a lot of fire and brimstone for those who do not fall into line. However, the central message contained in the Epic; that man is dependent on nature, that vainglorious kings should not anger the gods by destroying cedar forests, and that overpopulation can be a problem, is lost. Instead, we are told in the Book of Genesis (English Standard Version):

‘Let us make man in our image, after our likeness. And let them have dominion over the fish of the sea and over the birds of the heavens and over the livestock and over all the earth and over every creeping thing that creeps on the earth.’ (Genesis 1: 26)

Exclusivity and a feeling of superiority at being the ‘chosen people’ had the unfortunate effect of cementing competition into society, and the Lord’s granting of dominion over the Earth has allowed the planet to be plundered for the benefit of a single species. More tragic still, is that these ideas have proven remarkably resilient. Even modern economic theory defines society as a collection of individuals who are involved in a struggle to acquire more land and wealth, usually at the expense of someone else. It also views natural resources as a commodity to be bought and sold, that lacks any value other than its market price. Clearly the authors of the Torah and the Old Testament did not predict such developments, any more than they envisaged a man landing on the moon, but it does portray an arrogance about our place in the world, and a very anthropocentric view of the relationship between mankind and the natural world. This is surprising as environmental problems, such as salinisation, was already a major problem in Ancient Mesopotamia; so a touch of humility would not have gone amiss.

Salinisation occurs when agricultural processes, such as ploughing and irrigation, mobilise salt deposited in ancient sea-beds, or when deforestation results in soil erosion. One of the ancient Sumerian poems, ‘Bilgames and the Aga’, tells how Akka, the king of Kish, lays siege to Uruk because his own city state is running out of drinkable water. Drought and salinisation was largely responsible for the fall of the Akkadian Empire, and may well have contributed to the decision by Abraham to leave the ancient Sumerian city of Ur and set off in search of pastures new. No one is quite sure when Abraham left his home city, known in the Bible as “Ur of the Chaldeans”, but it is likely to be during the period of severe political instability following the death of King

Hammarubi in 1750 BC (See Chapter 7). This is also the period in history that the Old Babylonian Version of the Epic and the legend of Atrahasis were first formulated. So, did Abraham take any of the Sumerian or Akkadian legends with him? Or did he take a set of commandments written on lapis lazuli that represented Mesopotamian wisdom distilled from the various legends extant at that time?

According to Jewish tradition, Abraham's father, Terah, was a polytheistic priest who provided idols for the local community. It was he who organised the migration to the land of Canaan, but he only got as far as Haran, where he died. Was he the one who provided his son with the original commandments written on lapis lazuli, and is the Jewish word Torah a recognition of Terah's contribution to the world's first monotheistic religion? The answers are lost in the mists of antiquity, but this speculation would certainly fit with the Mesopotamian tradition of fathers providing wise counsel to their sons; and it would explain why Moses, six generations later, needed to smash the commandments written on lapis lazuli and substitute his own version written in stone.

Like lapis lazuli, cedar trees were greatly prized in the ancient world. At one time the slopes of mountains on the eastern flank of the Mediterranean were covered in ancient cedar forests. The cedar species was *Cedrus libanus*, named after their location in Lebanon, which still uses the cedar tree as the emblem on its national flag.

We know that cities along the East Mediterranean coast, such as Byblos and Tyre, started using cedar wood for ship building in the third millennium BC, and later the Phoenicians became the first sea-faring nation. They traded with the Egyptians who used sawdust from cedar trees for mummification and cedar resin (cedria) for embalming. Gilgamesh, however, was cutting down cedar trees to build the doors and roofs of his palaces from an even earlier date.

Cedrus libanus grew at an altitude of between 1300 and 2100 metres on the Jebel Alaonite Mountains of Syria and Lebanon, and the Taurus Mountains of southern Turkey. They grow best in deep soil on west-facing slopes. *Cedrus libanus* is slow growing, and doesn't produce flowers until 25-30 years of age, but those standing alone are magnificent specimens, with flat tops not unlike acacia trees in Kenya and lower branches that spread out as far as 50 feet around the trunk.

The dark blue-green needles last for two years, but take several years to decay, so a deep litter is formed on the forest floor, more than a foot thick. Cedar wood smells sweet but tastes bitter; so it is resistant to pests and fungi. Even in the Victorian era, cabinet makers used it to discourage moths. People who walk in cedar forests report heightened awareness and a sense of well-being. Maybe there is an endorphin-releasing chemical that has not been identified, but to



A fully grown cedar tree against the dawn sky (Copyright RRJ).



Cedar tree in Fulmer Bucks (Copyright RRJ).

Ancient Mesopotamians and Phoenicians the cedar forest must have appeared as a sacred place. Sadly mankind has plundered these ancient forests for his own glorification, and cedar trees have now dwindled to the status of a near-threatened species.

The cedar trees that Gilgamesh was after must have been located near to the River Euphrates in Southern Turkey, but these forests have mostly disappeared. Once cut down, the trees are replaced by scrubby growth, the soil is lost, and water cannot be retained.

Cedar wood formed the basis of an international trade in timber during the third millennium BC. Egyptian documents from 2600 BC record that the pharaoh, Snefru, imported 40 cargoes of undressed timber from Byblos in Lebanon, for boat-building. The ceremonial barge of Cheops, unearthed near the Great Pyramid in 1954, had fittings of Lebanese cedar wood, well-preserved after 4400 years and still 'sweet smelling'. Cedar wood was used by the Sumerians, Assyrians, Babylonians, Persians, Romans, and Israelites for construction purposes, but the twentieth century witnessed further ravages. Cedar trees were used by the Ottoman Empire as fuel for trains and by the British in World War Two to build a railway from Haifa to Beirut to Tripoli (HBT). HBT was used by the military from 1942 until February 1948, when the bridges were blown up by the Jewish insurgency in Palestine. It was the last link connecting standard gauge railways in Europe and Africa.

Throughout recorded history, there are many numerous references to the beauty of cedar trees, and there have been a number of explicit efforts to preserve the cedar forests in the Levant: in the Bible, King Solomon made 'cedar as plentiful as the sycamore-fig trees in the foothills' (1 Kings 10: 27, NIV). This suggests an exercise in the replanting of cedar trees, thus reinforcing Solomon's reputation for wisdom.

In the second century AD, the Emperor Hadrian, known as one of the five 'Good Emperors', claimed the cedar forests in Lebanon as an imperial domain and stopped further logging. Approximately 200 inscriptions on boundary stones have been found, but trees were later used as fuel for lime kilns and forests were cleared for grazing or farming.

In 1876, Queen Victoria paid for the construction of a high stone wall enclosing a 102 hectare (250 acre) site, to prevent cedar saplings being eaten by goats in the wild Cedar Grove at Bcharreh, birthplace of the poet Kahlil Gilbran. Since 1985, there has been a replanting programme in Lebanon, organised by the Committee of the Friends of the Cedar Forest. The organisation is dedicated to preserving the Cedars of God in the Qadisha valley – the same grove about which Queen Victoria was so concerned, but which now boasts a ski resort. There has also been a replanting programme in the Taurus mountains of Southern Turkey, West of the Euphrates River.

These are all fine efforts to preserve the ancient forests, but they have failed to prevent the destruction of one of the wonders of the natural world. *Cedrus libanus* is now officially classified as LR/nt on the IUCN Red List of threatened species, 'nt' indicating near threatened, and it was all started by Gilgamesh in 2750 BC.

Like kings throughout history, world leaders appear immune to environmental destruction and blind to the existential threat facing humanity. If we can decipher where it all began to go awry, if we can understand the mentality that regards growth as the only possible definition of progress, if we can persuade religious leaders that no belief system is more important than nature, if we can persuade the financial world that money is less important than family, and if we can persuade politicians to think beyond the next election, then it may be possible to avoid irreversible damage to the ecosystems that sustain life on this planet, and avert the looming catastrophe represented by climate change.

But time is against us. Since 1850, temperatures world-wide have increased by 0.85 degrees Celsius (C) due to the release of greenhouse gases into the atmosphere, and in 2016, the combination of global warming and a strong El Nino effect pushed global temperatures 1.1C higher than the pre-industrial average. The most important greenhouse gas is carbon dioxide (CO₂), which accounts for most of the global warming effect. CO₂ is extremely long-lived, so any releases into the atmosphere will continue to influence the climate for decades and even centuries into the future. Although temperatures have only increased by 0.85°C thus far, the greenhouse gases already in the atmosphere will eventually result in a further 0.6°C of warming after equilibration has occurred. This is perilously close to the limit of 1.5°C of warming agreed at the UN summit on climate change held in Paris in December 2015. The carbon budget that remains, if we are to have a 50% chance of staying within the 1.5°C limit, is only 140 billion tonnes of carbon. Currently the world emits 10 billion tonnes annually, so we only have 14 years of "business as usual" before we exceed the internationally agreed target (See Chapter 8). Pledges to reduce emissions of CO₂ made at the UN Summit on climate change in December 2015 will still allow temperatures to increase by 2.7°C, and that was before Donald Trump announced his intention of tearing up the "Paris Agreement". The last time in the Earth's history that global temperatures rose by 3 degrees centigrade, sea-levels were 20 metres higher than today.

The other major concern is methane. Methane is a greenhouse gas that currently accounts for roughly 20% of global warming. Although it is relatively short-lived in the atmosphere compared with CO₂, it is 86 times more powerful than an equivalent mass of CO₂ over a 20 year time frame, and has the potential to create atmospheric concentrations in the short-term that will make

climate change irreversible. Shale gas is 95% methane, so methane is released by fracking and by other technologies used in the extraction and mining of fossil fuels. However methane is also generated from a variety of other sources, including cattle and other ruminants, wetlands and paddy fields, but more importantly from the Arctic. Everyone involved in climate change research knows that there is a methane time-bomb ticking away in the permafrost at high latitudes, and also lurking in the Arctic sea-bed in the form of clathrates. If global warming reaches the point where the permafrost melts, or the Arctic sea bed releases methane, then this will accelerate climate change to a point where mankind can no longer exert any influence over the warming process. It is estimated that there is more than a billion tonnes of methane locked up in permafrost, almost twice what is already present in the atmosphere. In 2013, observations in the Siberian Arctic showed methane releases from permafrost that are four and a half times higher than in 2006, and 34 times higher than historical estimates of 0.5 million tonnes annually.

There are reckoned to be 500 billion tonnes of methane locked up in Arctic ice shelves and the sea-bed. As global temperatures rise, huge quantities of methane will be released. Peter Wadhams and co-workers from the University of Cambridge, writing in *Nature* in 2013, calculated that 50 billion tonnes of methane could be released from the East Siberian Ice Shelf at any time.⁴ The Ice Shelf is only 50 metres from the surface, and 50 billion tonnes of methane would add another 0.6 degrees to global warming. That is a lot when you consider that the global temperature has warmed by less than one degree since the start of the industrial revolution.

The problem with global warming is that it is unlikely to proceed in an incremental fashion. Tipping points will occur when the world's climate lurches from one steady state to another. This has happened on previous occasions in the history of the planet, and there is no reason to think that it won't happen again. The processes that drive these sudden changes are positive feed-back mechanisms, whereby a change in one direction augments further change in the same direction. Thus, with methane, releases from permafrost will contribute to global warming, and the increase in temperature will cause more thawing of the permafrost, further releases of methane and so on. The process will only stop when all the methane has been released, and that includes the 500 billion tonnes locked in the Arctic seabed. The result will be irreversible climate change and an environment incompatible with most current life forms on the planet. The really scary aspect of this scenario is that no one knows exactly when methane releases from the Arctic are likely to occur and it is therefore very difficult for climate scientists to include methane in their computer

4 Whiteman et al., 'Climate Science: Vast costs of Arctic change', *Nature*, 2013, 499, 401-3.

models predicting the likely consequences of global warming. Consequently the Intergovernmental Panel on Climate Change (IPCC) has adopted a very cautious approach to methane – cautious in the sense that they have designated it as a high impact, low probability event, and then exclude it from their models predicting likely temperature rises over this century.

This may turn out to be a mistake. Global levels of atmospheric methane, which plateaued in the late nineties, have started once again to increase, for reasons that are still unclear (Fig 1 p 15). An obvious explanation is increased oil and gas production, particularly shale operations in North America, as the rise in atmospheric methane from 2007 coincided with a significant increase in fracking. Schneising and co-workers⁵ used satellite data to show that methane emissions from two shale fields in North America (Bakken and Eagle Ford) were an order of magnitude higher than predicted by the US EPA using ground-based measurements; and a more recent study from Harvard⁶ showed that methane emissions from the US were responsible for 30-60% of the global growth in atmospheric methane levels over the past decade. However fossil fuel methane is accompanied by ethane, and the level of ethane in the atmosphere has not increased as predicted; so scientists have speculated that biogenic sources of methane are more important. However this discrepancy in the data can be explained if one assumes that the ethane/methane ration for oil is higher than for natural gas, and that gas now represents the main source of fossil-fuel derived methane.⁷

It has to be said that this is an area of intense scientific debate at the present time (See correspondence in the *Financial Times* on 4th March 2016 from the author (Appendix A p. 205) and further correspondence on March 7 and 14); but uncertainty about rising levels of methane is one of the main reasons that the global warming target was lowered from two to 1.5 degrees Celsius during the Paris summit of December 2015. For that target to be met, we need to abandon fossil fuels in favour of renewables and energy conservation, so that 100% of electricity is being generated from non-fossil fuel sources by 2030. Otherwise, 'business as usual' will end in an environmental catastrophe that human civilisation is unlikely to survive.

One only has to look back to the geological record to realise that this has happened before. The Permian extinction was a dress rehearsal for what is now

5 Schneising, O. et al., 'Remote sensing of fugitive emissions from oil and gas production in North American tight geological formations', *Earth's Future*, 2014, 2: 548-57.

6 Turner, A. et al., 'A large increase in US methane emissions over the past decade inferred from satellite data and surface observations', *Geophysical Research Letters*, 2016, 43:2218-24.

7 Cowern N. "Role of shale production in the recent rise in atmospheric methane" Abstract IMM Conference; Antwerp, Nov 29, 2017.

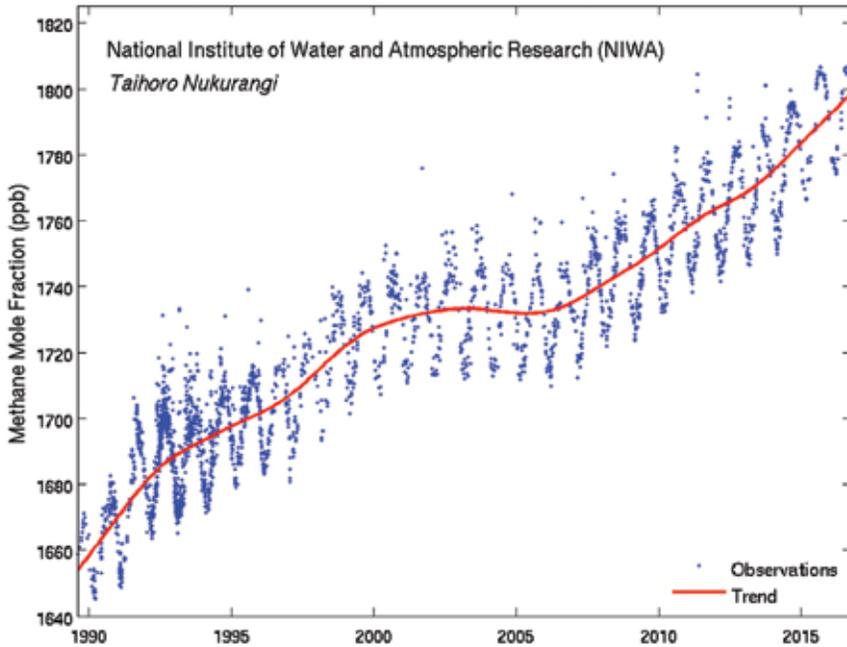


Figure 1: Atmospheric Methane at Baring Head (Courtesy of Dr Hinrich Schaefer and Dr Sylvia Nichol NIWA 2017)

occurring with anthropogenic climate change, and the net result 250 million years ago was that 90% of species were wiped from the planet. The Permian extinction occurred when huge quantities of CO_2 were released from volcanic activity in the Siberian traps over a period of 100,000 years. On this occasion, climate change is occurring far more quickly, so very few species can adapt quickly enough, and next to nothing may survive.

Having declared the purpose of this book, why the title? What is the Gilgamesh gene? In 1982, I had the privilege of meeting one of the greatest scientists that ever lived. Clair Patterson was born in Mitchell, Iowa. As a child, he was fascinated by scientific experiments and, in 1943, he graduated from Brunel College and started work on the Manhattan project, separating uranium isotopes by means of ultracentrifugation. He was therefore directly involved in the production of the world's first atomic bomb. He was horrified by the events in Japan: in his own words, 'we burnt them alive', and after the war he dedicated himself to scientific enquiries that would benefit mankind.

He was recruited by Harrison Brown, who had conceived the idea of dating the age of the Earth using the minute quantities of lead present in an iron meteorite formed at the birth of the solar system. By contrast, the amount of lead in the Earth's crust results from the decay of uranium isotopes. Since the

half-life of these radioactive isotopes is known, by comparing the amount of lead isotopes in the Earth's crust with those present in an iron meteorite, it was theoretically possible to calculate the age of the Earth. The research was conducted initially at the University of Chicago and later at the California Institute of Technology. It soon became apparent to Patterson that measuring the minute quantities of lead present in an iron meteorite was a formidable task due to the contamination of his laboratory by modern sources of lead: lead in pipe-work, lead in paint, in glassware, in dust and, most importantly, lead in the air. Clair Patterson therefore had to build an ultra-clean laboratory that excluded the possibility of terrestrial lead contamination and he developed a technique – isotope dilution mass spectrometry – that was capable of measuring the minute quantities of lead present in his samples. The actual measurement took less than 24 hours, but the preliminary work needed to prepare the samples free of any terrestrial contamination took Patterson seven years of painstaking dedication.

Once Patterson had finally succeeded in preparing his samples free of modern day contamination by lead, he took them to the Argonne National Laboratory in Illinois; working alone through the day and evening, he finally produced a result in the early hours of the morning. His initial calculations produced an estimate of 4.5 billion years, a figure that was revised to 4.55 billion in his seminal paper published in *Science* in 1955⁸.

There are only three things that a schoolchild wants to know about the earth; its circumference, its mass and its age, and it required three scientific geniuses to provide the answers. Its circumference was calculated by a Greek living in Egypt in 240 BC, Eratosthenes, and his calculation as to the Earth's circumference is accurate to within 10%. In 1798, Henry Cavendish calculated the density of the Earth to be 5.48 times the density of water, a figure that is within 1% of the actual value. Knowing the density of the Earth allowed Cavendish to estimate its mass, as well as the gravitational constant that had eluded Sir Isaac Newton a century earlier. It took a further 255 years before Patterson determined its age. Although such discoveries might appear to be the work of individuals, that is not what Patterson claimed publicly. Instead, he uttered the unassuming phrase, 'we did it', which is curious, because if ever one man working alone achieved something remarkable in science, it was Patterson when he dated the age of the Earth – but, of course, what Patterson really meant was that 'we', the scientific community, 'did it', because no scientist works in isolation. As someone once famously said, 'if we can see farther, it is only because we can stand on the shoulders of the giants who went before'. The actual metaphor is of dwarves standing on the shoulders of giants; it was used

8 Patterson, C., Tilton, G., and Ingram, M., 'Age of the Earth', *Science* 212: 69-75

by Sir Isaac Newton in 1676, but is derived from Bernard of Chartres in the twelfth century (*'nanos gigantum humeris insidentes'* in Latin).

It is revealing that the numbering system invented by the Sumerians started the scientific endeavour that allowed Eratosthenes to calculate the circumference of the planet, and Patterson to date the age of the Earth five millennia later. 1, 12, 60 and 3600 may seem a bizarre system of numerology, but it was good for counting sheep and has served us well ever since. The sexagesimal system has given us 12 months in a year, and 12 hours times two in a day. Jesus had 12 disciples. There are 60 seconds in a minute and 60 minutes in an hour; so multiplying 60 by 60 yields 3600, which provides a system for expressing the great age of divine rulers in the Mesopotamian King Lists, but also the number of degrees in a circle (360). It was these divisions that allowed Eratosthenes to calculate the Earth's circumference. He knew that the sun shone directly down a well at noon on a mid-summer's day, as the well in southern Egypt is located on the Tropic of Cancer. 5000 stads further north he measured the angle that the sun made striking a vertical pole in Alexandria. The angle was 7.5 degrees, so the circumference of the Earth is 360 divided by 7.5 times 5000 stads, or 240,000 stads. According to Herodotus, the Greek historian, a stad is the length of a stadium where Greek athletes competed, and represents 600 feet. However, the exact length used by Eratosthenes has been the subject of considerable debate, as the Greek stad is different from the Egyptian stad. Even so, his estimate in the third century BC is within 10% of the true value, at worst.

By dating the age of the Earth, Patterson should be viewed as heir to Eratosthenes, and undoubtedly deserved to receive at least one Nobel prize. But he was a geochemist and there was no category for that particular discipline in the deliberations of the Nobel Prize committee, so he was passed over. Patterson's other problem was that he had not discovered anything that was commercially useful, such as gunpowder, the discovery for which the Nobel Prize was first awarded. By contrast his subsequent scientific endeavours exposed the world-wide contamination of natural ecosystems and humans by the addition of lead to petrol, and this threatened the commercial viability of the petrochemical industry, in the same way that Joe Farman's discovery of an ozone hole over Antarctica in 1983 threatened the profits of CFC manufacturers. Farman was not awarded a Nobel prize either.

In 1982 I organised an international conference in London on behalf of CLEAR, the Campaign for Lead Free Air which Patterson attended as a keynote speaker. During the week of the conference, I invited Clair Patterson, Herb Needleman and Ellen Silbergeld to dinner at my house, along with Des Wilson, who was the leader of the CLEAR campaign. Over brandy we fell to discussing the state of the world and how it was that a potent neurotoxin had been added to petrol and disseminated globally, raising levels of lead

contamination to a level where they affected the neurocognitive development and IQ of children everywhere. Patterson said something very interesting. He said: ‘Mankind has a gizmo. I am not sure where it came from but it leads him to do incredibly stupid things. If we don’t learn to control our gizmos, it will lead to our own destruction.’

That gizmo is the Gilgamesh gene.

Before he left for the States, I asked Patterson how he had kept working in the



The above picture was taken in the garden of the Old Cottage, Stoke Poges in 1982.

On the left is my late wife, Annie, with our two children, Joy and Christopher (aged five and two). I am between Des Wilson and Ellen Silbergeld (Head of Toxicology at the Environmental Defence Fund, or EDF). Herb Needleman is on the right, and Clair Patterson is the one holding our cat (Shoo Ling). The CLEAR conference is the only occasion that Clair Patterson and Herb Needleman met, and this is the only photo that records their meeting.

face of constant hostility from the petrochemical industry and a high degree of scepticism from his fellow scientists. He answered: “Because we are guardians of human destiny.” It was many years later that I found the full quotation

‘Best scientists lack the comfort of peers.

Their science is always at first incredible
even though later it teaches more...

Why do they struggle so?

Because in each discovery of new knowledge

lies an awareness of the beauty and worth of human life

that enslaves them as guardians of human destiny.’ (23rd August 1981)

Chapter 1: The Epic of Gilgamesh

Like the Bible, that came many centuries later, the Epic of Gilgamesh is part myth and part history. Unlike the Bible, it is not clearly framed as a lesson in morality, but is interwoven with moral paradigms which the reader can interpret or derive from the elements of the story. Nor is it morally prescriptive. Lessons can be deduced, which allows a freedom of interpretation not granted by conventional monotheistic religions. Its ancient lineage takes us back to a time when there was a certain naivety about human affairs. It would be exaggerating to say that it was from the age of innocence any more than the Garden of Eden, but one senses the emergence of forces that are going to determine the trajectory of human affairs for centuries, if not millennia to come.

The question that immediately presents itself is a conundrum that has vexed chroniclers throughout history. Were these developments inevitable? How many choices did society have to order its affairs differently? Was it the peculiar attributes of Gilgamesh as a king that acted as a role model for future generations? Would history have turned out differently if Gilgamesh had chosen a woman as his soul-mate instead of Enkidu, a wild monster of a man who was only civilised by the touch of a woman? These are all fascinating subjects for speculation, but the Epic does not provide direct answers.

Nor does it pretend an ethical conclusion, let alone a rigid programme of how to live our lives so that we may be rewarded in the after-life. In that sense, it is free of the dogmas that bedevil Jewish Orthodoxy, Christian fundamentalists, or Sharia courts. Even so, there is an element as to how individuals should conduct themselves in order to find favour with the gods. Yet, the gods are multiple, mutually antagonistic, and capricious, so greater emphasis is placed on individual choice. As in other polytheistic religions, the panoply of divine characters reflects the multiplicity of human personalities, leaving city states considerable latitude in deciding which particular god they wish to worship or emulate.

This is nowhere demonstrated more clearly in the Epic of Gilgamesh than in its refreshingly open attitude to sex. The Judaeo-Christian tradition is an exercise in defining sex as a post-marital activity, with severe punishment for transgressors and adulterers which includes eternal damnation and the fires of Hell. Gilgamesh inhabits a very different world, where sexual urges are recognised as normal, not sinful, and where priestesses are available at the Temple of Eanna, residence of the goddess Inanna (Ishtar in Akkadian),

to satisfy men's desires without being made to feel guilty or perverse. Of course, we are not told what the women thought of these arrangements: this is clearly a male-dominated world. However, there is no indication that the high priestesses, who provided gratification so that 'even old men are aroused from their beds,' objected to their role in society. Indeed, there are even indications that they enjoyed their work, or at least took pride in their abilities to satisfy the supplicants who appeared at the doors of the temple. In one section, we read:

Every day is a festival in Uruk,
 With people singing and dancing in the streets,
 Musicians playing their lyres and drums,
 The lovely priestesses standing before
 The temple of Ishtar, chatting and laughing,
 Flushed with sexual joy and ready
 To serve men's pleasure, in honour of the goddess¹

Furthermore, when Gilgamesh learnt that there was a wild monster of a man roaming loose in the forest and running with the deer and the antelope, he decided, not to capture him with a battalion of soldiers, but to send a woman, Shamhat, the most skilled priestess in the Temple of Ishtar, in order to civilise Enkidu.

We know that many fairy tales have ancient origins that predate Christianity, but surely the subplot of Enkidu and Shamhat is the prototype for 'Beauty and the Beast'.

Another theme in the Gilgamesh Epic is the relationship that exists between human beings, on the one hand, and animals or gods on the other. Gilgamesh is one third human and two thirds divine. Enkidu, his soul-mate or alter-ego, is half man, half animal. This arrangement indicates a hierarchy of awareness or being which goes from animal, to human, to divine, and predates the development of more complex arrangements, for example, the seven levels of awareness in Hindu philosophy.

The idea of seven as a sacred number is clearly reflected in the legends surrounding Gilgamesh: In the Sumerian poem, 'Bilgames and the Netherworld', the ideal number of sons is seven. In the Epic, Uruk has seven gates; Enkidu made love to Shamhat for seven days; Humbaba had seven auras; Gilgamesh mourns his friend Enkidu for seven nights; the Ark has seven levels; the dove appeared on the seventh day; Utnapishtim puts out two rows of seven ritual vases as thanks for his deliverance from the flood; he challenges Gilgamesh to stay awake for seven days to test his fitness for immortality, and so on.

The idea of seven heavens also features in the religion of Ancient

1 Mitchell, Stephen, *Gilgamesh*, Profile Books, 2004.

Mesopotamia. In the Sumerian language, the names of the sky god and earth goddess are An and Ki. Sumerian incantations of the late second millennium BC make references to seven heavens and seven Earths. One such incantation is: 'an-imin-bi ki-imin-bi' ('the heavens are seven, the earths are seven'). In Sumerian mythology, Enki sent seven sages to Eridu, and in Judaism the Jewish candlestick, the Minora, has seven branches.

In Akkadian mythology, the only goddess to return from the netherworld was Ishtar, and she achieved this by shedding seven garments as she passed through each of the seven gates, and was therefore naked when she entered the underworld, presumably the historical precedent for the dance of the seven veils. During the Hajj, Muslim pilgrims in Mecca circumnavigate the Ka'aba seven times. During Hindu marriage ceremonies, the bride and groom circumnavigate the sacred fire seven times.

It is interesting that so many religions accord the number seven divine status. Clearly it is a prime number, and therefore indivisible, but a female cycle and a lunar month are both 28 days, so seven days represents the time for a half-moon to become a full moon and vice versa. It may also be relevant that, in Sumerian, the full moon is Sa-bat, which might explain why the seventh day becomes the Jewish Sabbath. One also has to accept that seven may have a much more ancient origin. Thus, around Mount Kenya, the Kikuyu tribe circumcises male infants seven days after birth.

Seven may be a heavenly number, but it was of little value when it came to accountancy. Here the Sumerians chose a sexagisimal system based on the number 12 rather than the decimal system based on the number 10. One explanation is that 12 can be divided five ways, being divisible by 1, 2, 3, 4 and 6, whereas 10 can only be divided three ways (1, 2 and 5).

In the religion of Ancient Mesopotamia, the world was divided into heaven, earth and the great underground lake or Absu from which springs fresh water. However heaven is not a place for humans as Gilgamesh explains to Enkidu:

We are not gods, we cannot ascend
to heaven. No, we are mortal men.
Only the gods live forever. ²

Sumerians believed that humans were created to relieve the Gods of menial tasks such as tilling the soil. The goddess Aruru fashioned man from clay mixed with the blood of a mischievous God. Since only Gods are immortal, the spirit of the mischievous God lives on after death in the netherworld, whereas humans return to the earth from which they came. 'Ashes to ashes' and 'dust

2 Mitchell, *ibid.*