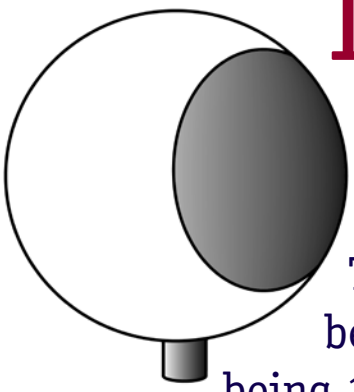
1. THE BIG BANG / FLARING FORTH

13.7 Billion Years Ago



THE SCULPTURE IS BASED on the oriental 'Yin Yang' symbol, representing the unity of opposites. It is used here, in three dimensional form, to symbolise the universe bursting out of not being into being.

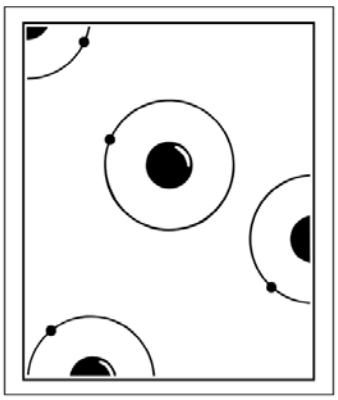
The most popular theory among scientists for the beginning of the universe, is that it exploded into being 13.7 billion years ago. This is known as the 'Big Bang Theory'. Since the idea was first suggested in the 1920s, it has been supported by a great deal of scientific observation. It is believed that the universe existed as an expanding cloud of gas for 1.7 billion years before the first stars formed, which is the subject of the next station.

MANY OF THE STARS in the night sky are so far away, that the pinpoints of light we see at night have taken millions of years to arrive here. This means that when we look deep into space with a telescope, we are looking into the past.
By studying the 'red shift' of starlight in 1929, Edwin Hubble discovered that the universe is expanding and cooling. In other words, the further back in time we go, the smaller and hotter the universe becomes. The logical conclusion of this observation is that the time line of the universe can be traced back to a point of infinite density and infinite temperature, a point at which the universe exploded into being.

This idea was first called the 'Big Bang Theory' in 1949, by astronomer Fred Hoyle who thought it ridiculous. Since then, however, it has generally been supported by observations. In the 1960s, physicists detected a background 'noise' of radio waves, which they believe to be the radiation released when electrons and atomic nuclei first combined to form atoms of Hydrogen and Helium, about 379,000 years after the 'Big Bang' 13.7 billion years ago. Physicists predicted these echoes before they were observed.

Tiny variations occurred in the gravitational field of the expanding cloud of hydrogen and helium. These tiny variations would eventually cause the first stars to form after 1.7 billion years.

2. FIRST GENERATION STARS
12 Billion Years Ago



THE PLAQUE REPRESENTS ATOMS OF HYDROGEN in the gas cloud of the early universe. After a time, gravity made the cloud lumpy. The biggest lumps became stars. Stars are formed when gravity becomes so strong that small atoms are squeezed together to form bigger ones, giving off huge amounts of energy.

The first generation stars eventually burned themselves out and imploded, scattering atoms into space. Our sun and the planets of our solar system were formed from these scattered remains. The creation of the solar system, 9.4 billion years after the first stars, is the subject of the next station.

IN ITS EARLY STAGES, the universe is thought to have existed as an expanding cloud of only the two lightest elements, hydrogen and helium. Very minor differences in the density of the cloud caused the gas to condense through gravity. This formed dense masses, squeezed so tightly by gravity that atoms of hydrogen, which have a single proton in the nucleus, fused to form helium, which has two. This nuclear fusion is what powers the stars, radiating energy across the universe.

The first stars ignited about 12 billion years ago. As they developed, they began to fuse larger atoms at the core. First helium fused to beryllium, then to carbon and oxygen, each level of fusion giving out further energy.

Eventually the stars developed a series of layers like an onion, with heavier and heavier elements being fused in each successive layer until a mass of iron formed at the core.

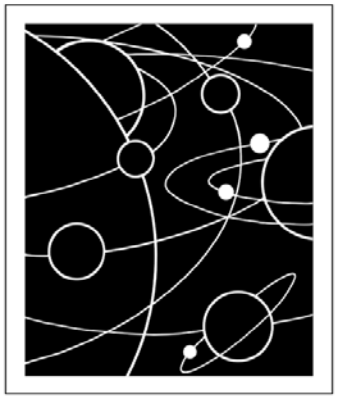
After billions of years, the iron in the core of the first generation stars built up to point where it stifled further nuclear fusion. Unsupported by the energy of nuclear fusion, the cores collapsed under the immense pressure of their own gravity.

The shock wave of this implosion caused the rest of these stars to explode as a supernova, spewing atoms forged in the nuclear furnace out into space.

Our own solar system, the sun and all the planets, was formed from this debris, 9.4 billion years after the formation of the first generation stars. That will be the subject of the next station.

3. CREATION OF THE SOLAR SYSTEM

4.6 Billion Years Ago



AS WE SAW AT THE LAST STATION, the first generation stars eventually imploded, and scattered bits of themselves into space in a cloud of dust. As these clouds of debris slowed down and cooled, gravity once again sucked them into lumps. Where these masses became large enough, they ignited into second-generation stars such as our own, which formed around 4.6 billion years ago.

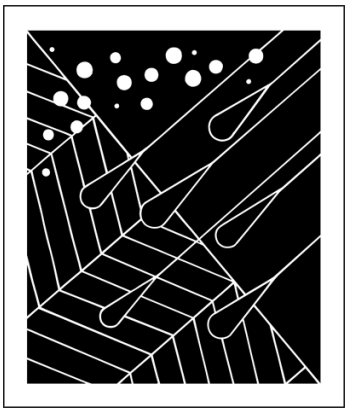
As the sun formed at the centre of our solar system, it was surrounded by a spinning disc of dust and gas. These small particles crashed into each other to form larger lumps, eventually forming the planets, including the earth. The energy of all the bits crashing into each other was so great that the surface of the earth was molten for hundreds of millions of years. After 300 million years, the earth would finally cool enough for the surface to solidify, and rain to fall. That will be the subject of the next station.

THE MOMENTUM of all the material sucked towards the centre of the gravitational field of the new sun, caused it to spin. Around the sun a disc of gas and dust formed that was spinning so fast that centrifugal force kept it from falling in. This 'accretion disc' was chaotic, with particles crashing into each other at thousands of kilometres per hour. Particles in the disc accreted into larger lumps, attracting more particles by gravity and ultimately forming the planets. Not all of the material has been incorporated into planets, but continues to spin around the sun as asteroids and comets, or tiny meteors that appear in the night sky as falling stars when they enter the earth's atmosphere.

The moon is thought to have formed from the debris thrown into space when a massive planetoid crashed into the earth, increasing its mass by about 10%. The crumpling and weathering of the earth's surface means that few of the craters formed by meteor impacts are still clearly visible. On the surface of the moon however, these craters remain obvious. This is because the moon has no atmosphere and is too cold to be geologically active.

4. LAND / SEA / ATMOSPHERE

4.3 Billion Years Ago



ABOUT 4.3 BILLION YEARS AGO, the earth was cool enough for the water vapour in the atmosphere to condense into rain. What followed must have been the greatest rainstorm in the history of the planet, eventually covering most of the earth's surface in water.

With the presence of water, one of the most important requirements for life as we know it was in place. Life on earth probably began about 800 million years later and that will be the subject of the next station.

IN THE EARLIEST PHASE of the earth's history, it was a fairly undifferentiated ball of molten matter, from which lighter elements boiled off into space. As the rate of meteor impacts decreased and the surface cooled, some gases such as water vapour, nitrogen and carbon dioxide no longer boiled off into space, but formed an atmosphere.

Eventually, about 4.3 billion years ago, the earth was cool enough for the water vapour in the atmosphere to condense into rain. What followed was the greatest rainstorm on earth, eventually covering most of the earth's surface in water.

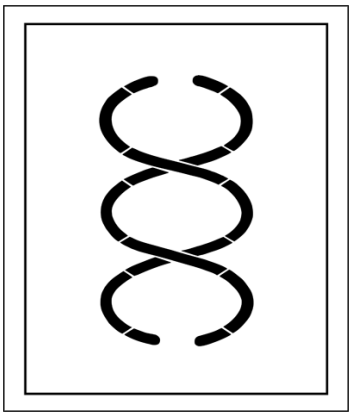
At the other end of the scale, the heavier elements fell towards the centre, where a core of iron developed, leaving the lighter elements to float to the top. On the surface, a thin crust of solid lava formed, which frequently melted again and re-solidified. With this flux and reflux, more and more of the heavier elements dropped out of the surface rocks, slowly building up the continental land masses from the lighter material which remained at the surface, floating on the heavier magma.

It is thought that it took about two billion years for the continental masses to build up to more or less the proportions of today, with about two fifths of the earth's surface covered in thick plates of continental rocks, while the remaining three fifths consist of a thin crust of solidified lava on the ocean floors.

Standing here beside the Blackwater River, it is interesting to reflect that much of the water flowing past may have been formed by the collision of hydrogen and oxygen atoms in space following the destruction of the first generation stars. Molecules of this water formed an important fraction of the accretion disc around our sun as the planets formed. Comets are surviving fragments of that disc, and are known to consist largely of ice.

5. LIFE ON EARTH

3.5 Billion Years Ago



THE PLAQUE REPRESENTS the double spiral form of the DNA molecule, which is the key to reproduction of all forms of life on earth. The first living things must have been so small that they have left no trace, so it is impossible to know exactly when life on earth began. The best guess is that it started about 3.5 billion years ago.

The earliest known fossils are limestone nodules formed by colonies of bacteria. These are called stromolites and are found in rocks about 3 billion years old. The oldest rocks in Ireland are just 1.8 billion years old. You will find a boulder of it, to the left of the path, forming the next station.

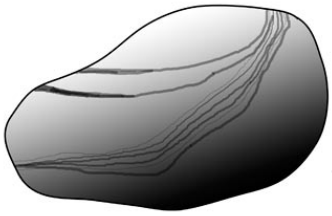
THE EARLY OCEANS must have been a soup of complex carbon molecules. At some point, the spark of life appeared among them, with molecules capable of reproducing themselves. For almost 3 billion years, no living organism was larger than a single cell.

The earliest single celled organisms probably used methane or hydrogen in their metabolism instead of oxygen, as the earth's atmosphere contained no free oxygen. Colonies of the bacteria that formed the earliest known fossils, the stromatolites, can still be found in extremely salty water in Australia. They are a type of cyanobacteria. The cyanobacteria were the first orgnanisms to use the energy of the sun to extract carbon from CO_2 in the atmosphere, just as plants and algae do. This process of photosynthesis created the conditions for many other forms of life, by releasing oxygen into the atmosphere.

Single celled organisms are still by far the most common form of life on earth, accounting for the majority of species, and by far the majority of the world's biomass. In this sense, single celled organisms are still the 'normal' form of life on earth: bigger organisms like birds, bees, shrubs and trees are the exceptions. Single celled organisms also occur in the most extreme habitats of the earth, from the intense heat of sulphur springs on the ocean floor and deep cracks in the earth's crust, to the frozen extremes of mountain peaks and polar ice caps.

6. OLDEST ROCK IN IRELAND

1.8 Billion Years Ago



THIS STONE is a piece of the oldest rock formation in Ireland, known as the Annagh Series, from the coast of north Mayo. About 1.8 billion years ago, this rock solidified at the root of a mountain range.

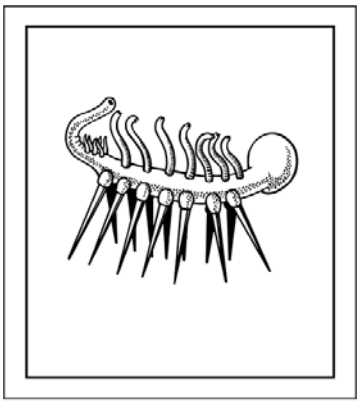
By this time there had been life on earth for 1.7 billion years, and photosynthetic organisms were gradually building up free oxygen in the atmosphere. 1,270 million years after this rock was formed, multi-cellular life forms appeared. That will be the subject of the next station.

THE ANNAGH SERIES ROCKS started as granite, which cooled slowly at the root of an ancient mountain range. Like the mountains of today, it was formed when two plates of the earth's crust collided. The mountains have long since eroded away and the granite has been squeezed at immense temperature and pressure by later geological events, which have metamorphosed it into gneiss.

Rocks identical to the Annagh Series gneiss have been found in Nova Scotia, Canada. They are in fact part of the same formation, which was split in two by the break up of a former continent to form the Atlantic Ocean. This started relatively recently in the Jurassic period, a mere 200 million years ago. North America and Europe are still drifting apart at a rate of a few centimetres every year.

Microorganisms had been living in the oceans for over a billion years when this rock was formed. They play an important part in the process of continental drift. A rain of dead plankton falls to the ocean floor, where it forms a layer of fine mud or 'ooze'. This ooze lubricates the oceanic plate where it slides under continental margins, as it does beneath the Andes in South America. As it does so, it carries a great deal of water with it. This water reacts with the basal rocks of the continents and causes the rock to melt at much lower temperature. It then flows upwards through cracks in the crust and erupts in the form of volcanoes.

7. MULTI-CELLULAR LIFE
530 Million Years Ago



THE FIRST MULTI-CELLULAR CREATURES in the fossil record show up in rocks from about 530 million years ago. A dizzying variety of creatures appeared in a burst of evolutionary creativity known as the 'Cambrian Explosion'. The plaque illustrates one of the strangest of these fossil creatures, *Hallucigenia sparsa*, which grew up to three centimetres long.

Most of the basic body forms or 'phyla' of animals evolved in the sea over a mere 50 million years or so, while the land surface remained completely bare. The rocks of the Nagle Hills (to the south of the river) were laid down 160 million years later, on what remained a largely desert continent, surrounded by an ocean teeming with fish. This period will be the subject of the next station, marked by a small bronze sculpture of a fish mounted on a boulder of local sandstone.

THE SPECIES in the Cambrian oceans were radically different from today, but recent research has shown that almost all modern 'phyla' or body plans of animals were present very early. Even more surprisingly, many of the fossils would appear to have no modern counterparts. In other words, they may represent communities containing more phyla, or fundamental variety, than exist on the planet today.

This insight has led to a changed view of the evolution of higher animals. Starting with an evolutionary 'Big Bang' in the Cambrian, evolution proceeded rapidly, as species evolved to fill all the ecological niches created by each other. With all the niches filled, a period of stability followed. From then on, evolution has proceeded as a series of bursts of creativity following catastrophic extinctions.

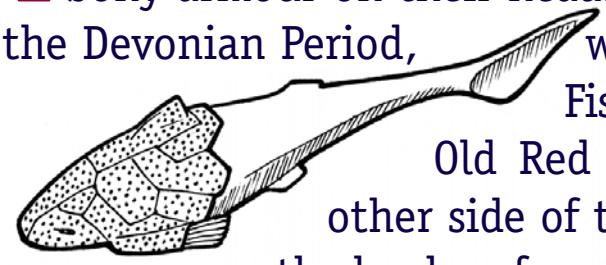
In each period of evolutionary creativity, organisms co-evolve, each species shaped by the presence of the others within its ecosystem. This develops until a balance is achieved, and evolution slows down. These periods of stability are punctuated by extinctions, many so large as to wipe out most species. In the aftermath of extinctions, a vast array of ecological niches become available to the survivors, allowing a new burst of evolutionary creativity.

Each extinction may actually reduce the number of phyla and genera, but leads to a radiation of the surviving genera to fill the available niches with new species. Extinctions have a variety of causes, the best known being the massive meteorite impact believed to have caused the extinction of the dinosaurs.

In this model, the victims of extinctions are not the losers in a struggle for 'the survival of the fittest', in the classic Darwinian model, but are the victims of chance events. Competition is a vital factor in the radiation of survivors into newly available niches in the aftermath of extinctions.

8. THE AGE OF FISHES
370 Million Years Ago

THE SCULPTURE REPRESENTS a placoderm fish. They had plates of bony armour on their heads and were common in the oceans of the Devonian Period, which is also known as the Age of the Fishes. The boulder is a piece of Devonian Old Red Sandstone from the Nagle Hills on the other side of the river. The sand was laid down on the land surface 370 million years ago and contains no fossils, because terrestrial plants were only beginning to evolve. While the sea was teeming with life, the land surface remained largely desert.



In the late Devonian, the first real trees did make a brief appearance, along with the first land vertebrates. It was not until the Carboniferous Period, however, that the land plants really got underway, creating vast habitats for land animals to occupy, about 315 million years ago. That will be the subject of the next station, marked by a bronze sculpture of an amphibian, mounted on a boulder of local limestone.

FOSSILS OF *Archaeopteris sp.* trees have been found in Devonian rocks at Kiltorcan in Co. Kilkenny. They were the first real trees and grew up to 30 metres tall, with fern like fronds of leaves. They grew in forests that fringed much of the world's continents at the time.

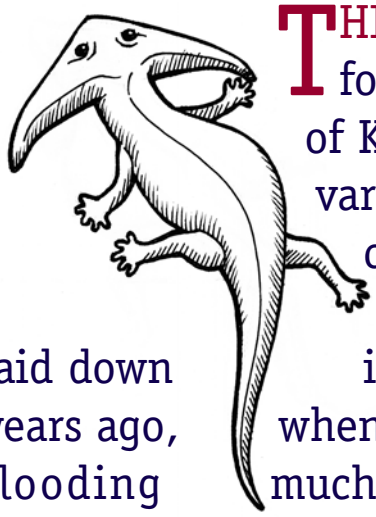
The earliest fossils of four legged or 'tetrapod' animals also date from this period. In rocks on the shore of Valentia Island, Co. Kerry, the oldest tetrapod footprints in the world have been found. They are preserved in what was a muddy shoreline 385 million years ago.

The end of the Devonian is associated with one of the greatest extinction events in the history of the world. Most shallow water species of coral and fish disappeared, along with the great *Archaeopteris* trees. The trees may have played a part in the extinction, by introducing huge amounts of oxygen into the atmosphere, causing the melting of the polar ice caps.

At least some of the extremely rare tetrapods must have survived, as we shall see at the next station.

9. LAND PLANTS /AMPHIBIANS

315 Million Years Ago



THIS LITTLE SCULPTURE is a reconstruction of a rare fossil called *Keraterpeton,* found in the coal mines of Kilkenny. *Keraterpeton* was one of an amazing variety of amphibians that evolved rapidly in the coal swamps of the late carboniferous, about 315 million years ago. The boulder is of local limestone laid down in the early Carboniferous, about 359 million years ago, when the polar ice caps melted and the sea level rose, flooding much of the old Devonian continent under a warm shallow sea.

The amphibians were the first major group of land vertebrates, related to modern frogs, newts and salamanders. They were limited to wet places by their porous skins and their need to lay eggs in water. The reptiles would soon evolve to solve both these problems, becoming the dominant land vertebrates about 270 million years ago. That will be the subject of the next station, marked by a bronze sculpture of a small lizard on a boulder of chalk from Ulster.

DURING THE EARLY Carboniferous, two continental plates of the earth's crust were moving towards each other, north and south of the equator. As they approached, the sea between them became shallow and muddy, eventually developing into an enormous tropical swamp-forest.

The Carboniferous forest consisted of completely new species of trees, unrelated to the *Archaeopteris* species of the Devonian, which were already extinct. On the forest floor, a peat layer developed, up to 30 metres thick. This is preserved in many places in the world as a band of coal.

When the amphibians appeared, there was already plenty to feed upon. The swamp forest was populated by a huge variety of creatures, especially arthropods. These included flying insects and huge millipedes, which fed on plants and rotting vegetation. Within a comparatively short time, the amphibians developed a huge range of characters and lifestyles. Some lost their legs to become snakelike, while others returned to an aquatic way of life. Among them was a group that broke away from dependence on water, evolving into the reptiles, as we shall see at the next station.

10. THE AGE OF THE REPTILES
270 Million Years Ago

THE SCULPTURE represents *Paliguana*, a small, early predator reptile from about 270 million years ago. It is sitting on a block of chalk from Co. Antrim. This dates from the Cretaceous Period, about 100 million years ago, when the dinosaurs were at their peak.

The Age of the Reptiles followed the greatest extinction of the last 600 million years. At the end of the Permian, the dinosaurs dominated the land habitats of all the continents while great marine reptiles dominated the oceans and Pterosaur reptiles dominated the sky. They were all but wiped out about 70 million years ago, when an enormous meteorite crashed into the earth, causing the extinction at the end of the Cretaceous. The first true mammals appeared about 200 million years ago, but would remain insignificant for another 130 million years.

Following the cretaceous extinction, the mammals became the dominant land animals. That will be the subject of the next station, marked by a bronze sculpture of a typical early mammal, mounted on a boulder of basalt from Ulster.

AT THE END of the Carboniferous, the great equatorial coal swamps dried up. This greatly reduced the habitat of the amphibians, which constitute a relatively minor part of the fauna today, represented by frogs, toads, newts and salamanders.

The reptiles first appeared in the late Carboniferous, where they made relatively little impact in the great swamp forests. They had two advantages: waterproof skins and, most importantly, amniote eggs with an outer shell, which could be laid on dry land. In the drier conditions of the Permian, they rapidly diversified, dominated ultimately by large Therapsida, the mammal like reptiles, ancestors of the true mammals. The Therapsida were almost wiped out by the great End-Permian extinction, which paved the way for the dominance of the reptiles, which reduced the mammals to a handful of tiny skulking species.

No rocks containing dinosaur bones have been found in Ireland, the only rocks from the period being chalk, which is formed from the shells of tiny plankton falling to the bottom of the sea.

11. THE AGE OF MAMMALS

65.5 Million Years Ago

THE SCULPTURE REPRESENTS a marsupial mammal, *Sinodelphys szalayi*, which lived 125 million years ago. At fifteen centimetres long, they were typical of the small early mammals that barely survived in a world dominated by mighty dinosaurs. The sculpture is sitting on a piece of basalt from Antrim that dates from the Cenozoic, which began 65 million years ago, after the extinction of the dinosaurs. This extinction was largely due to a massive meteor that crashed into the earth about 70 million years ago. Following the extinction, the tiny mammals rapidly radiated into the vacant niches of the great reptiles, establishing mega-faunas on each of the continents and in the oceans. Though the mammals did take to the air in the form of bats, the skies are still dominated by birds, the one branch of the dinosaurs that remains successful.

About 200,000 years ago, the first communities of *Homo sapiens* appeared, and that will be the subject of the next station.

THE MOST IMPORTANT development in the plant world during this period, was the evolution of grasses, which co-evolved with grazing mammals. The grasses became well adapted to survive grazing, while the grazing mammals evolved high crowned teeth, adapted to a diet of abrasive grasses. This co-evolution led to the development of extensive grassland prairies and savannas, populated by fast, long legged mammals like the horses.

About 5 or 6 million years ago, the hominid lineage of upright apes began to appear among the grassland mammals of the African Rift Valley. By 3.5 million years ago, remains of Australopithecines appear, associated with simple stone tools. The genus Homo arrived about 2 million years ago and migrated into Eurasia. Their remains are associated with more sophisticated tools, some made of wood.

In Ireland, most of the sediments of this period have been scraped away by the ice sheet, which only retreated in the last 10,000 years, leaving no fossil record of the great flowering of the mammals, or of early man. The human record here begins with the arrival of Mesolithic men, after the ice melted.

12. THE EVOLUTION OF MANKIND
200,000 Years Ago

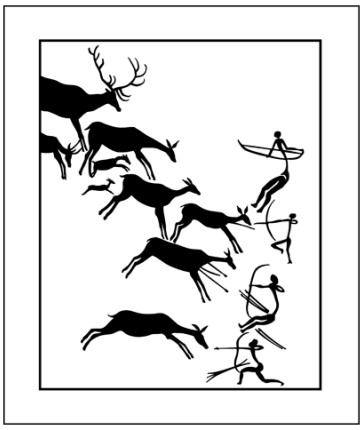
OUR SPECIES evolved in Africa. Our close relatives, the upright hominid apes, first appeared there about 2 million years ago. The first humans, the Neanderthals, appear in the fossil record only about 200,000 years ago, with our own species appearing 70,000 years later. Compared to the time spans we have been considering up to this point, this is very recent. At the scale of the cosmic walk up to this point, the entire story from the appearance of the Neanderthals to the present day would cover just 23.36 millimetres. It is therefore necessary to hugely increase the scale, allowing 2 metres for every 1,000 years, to bring us to the present day.

Around 40,000 years ago, the first signs of art appear among the artefacts associated with man on several continents, indicating a major cultural change. That will be the subject of the next station.

NEANDERTHALS, *Homo sapiens neanderthalensis,* appeared about 200,000 years ago, and continued to evolve until about 30,000 years ago.

The earliest remains of people like ourselves, *Homo sapiens sapiens*, have been found in the East and date from about 130,000 years ago. We co-existed with the Neanderthals for some time in Europe, before they disappeared. We came out on top, in spite of the fact that Neanderthals had a larger brain capacity. It has been whimsically suggested that Neanderthals were a race of philosophers, which did not save them from being occasionally eaten by our own species and ultimately wiped out.

13. THE BEGINNING OF ART
40,000 Years Ago



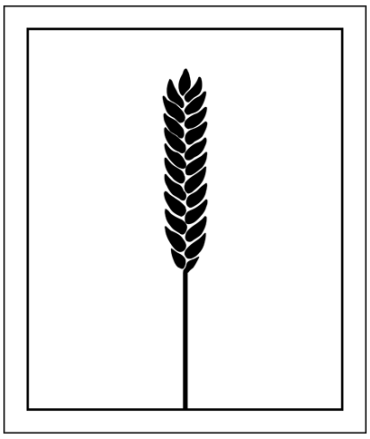
THE PLAQUE IS BASED on cave painting from the Cave of the Horses, Barranco de Valltorta, Spain. Between 40,000 and 35,000 years ago, art appears for the first time in human communities as far apart as Australia, India and Europe. Though we can never know much about the spiritual life of our prehistoric forbears, this does seem to imply some sort of awakening of the human spirit in widely separate communities.

The people who made these beautiful images and those in the Chauvais and Lascaux caves, lived a simple hunter-gatherer lifestyle. Hunter-gatherers are always on the move, rarely building anything more than temporary shelters, which melt back into the landscape. The arrival of farming led to a settled lifestyle, and for the first time, permanent monuments in the landscape. Farming didn't appear for a further thirty thousand years, and that is the subject of the next station.

IT IS IMPOSSIBLE to know what the purpose of the early art was, but they clearly express a profound respect for animals which are often minutely observed. People, by contrast, are usually more stylised where depicted at all. The images also appear in caves that were not living spaces as such but reserved for this activity, which must often have been done by fire light. This implies that the images are not decorative, but ceremonial, and were made in the context of some sort of religious practice. It is impossible to look at them without feeling that they were created out of a deep spiritual life.

14. THE BEGINNING OF AGRICULTURE

10,000 Years Ago



FARMING BEGAN in the Middle East, about 10,000 years ago, arriving in Ireland 5,000 years ago. Farming produced food surpluses, freeing up the labour resources required to build elaborate monuments, such as megalithic tombs and stone circles of the Boggeragh and Nagle Mountains. All the major Neolithic monuments are associated with burials, and reverence for the dead. Buildings for the living, on the other hand, were much less substantial and have left little trace. Clearly these people placed an immense importance on religious practice and the supernatural.

The surplus food produced by farming would eventually allow the building of cities and the development of the first states. This happened about 4000 years after farming began and will be the subject of the next station.

IT IS NO ACCIDENT that the area of the Middle East where farming began, the so-called 'Fertile Crescent', was extremely biologically diverse. It forms a land bridge between Africa, Arabia, Europe and Asia, with a range of high and low ground, accommodating plants and animals requiring a wide variety of climates. This bio-diversity was vital in providing the raw material for domesticating crops and livestock.

The range of major farm plants and animals is really very small and an extraordinary proportion of them were domesticated very early in the Crescent, including wheat, barley, sheep, goats and cattle. Farming arose independently in several places, including Melanesia and the Americas, and yet this suite of species dominates the agriculture of almost the entire planet.

The Crescent was also ideally located for the spread of both farming technique and domesticated species, because it is in the centre of the Eurasian land mass. With no impassable natural or climatic barriers, domesticated plants and animals rapidly spread East and West, to the Atlantic and Pacific seaboards and across North Africa.

15. CIVILISATION AND RELIGION
6,000 Years Ago

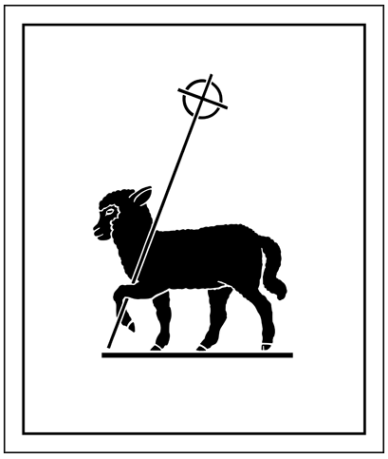
IT IS NOT SURPRISING that the first states arose about 6,000 years ago in Mesopotamia, in the area where farming began. The plaque is based on an Assyrian stone carving of King Gilgamesh, who ruled the city state of Uruk, around 2600 BC. He is also the central figure in one of the earliest surviving pieces of literature, the Myth of Gilgamesh.

As societies became more complex, the expression of human spirituality also became more sophisticated. One of the earliest great religions was based on the teachings of Zoroaster, who lived in Iran, probably around 900 BC. In India, the Hindu traditions were emerging around the same time, followed by Buddhism around 600BC.

In the eastern Mediterranean, where Africa, Asia and Europe meet, a religion developed among the Jewish tribes, based on the idea of a single, all-powerful God. Into this tradition, 2,000 years ago, Jesus of Nazareth was born, and through his teaching, these ideas spread throughout the world. That is the subject of the final station.

CITIES AND STATES require a great deal of work in areas such as administration, public works and defence. This level of complexity of society can only happen where farmers can produce enough food beyond their own immediate needs to feed such specialist workers. In Mesopotamia, the production of agricultural surplus required complex irrigation systems to control the water of the great rivers. The level of social co-operation in achieving this may in itself have encouraged the development of towns and cities, and ultimately of states.

16. THE BIRTH OF CHRIST
2,000 Years Ago



CHRIST, represented here as the Agnus Dei, the Lamb of God, was born in Israel, just over 2,000 years ago. At the core of his teaching is the idea of a God of love and forgiveness, who is best served by selfless humility and the service of others, exemplified in his own life and sacrifice. 1,718 years later, close to the spot where the sundial records the passing hours, Nano Nagle was born. In her life and work she followed Christ's example with a diligence and zeal that has been to the benefit of many and an inspiration to generations.

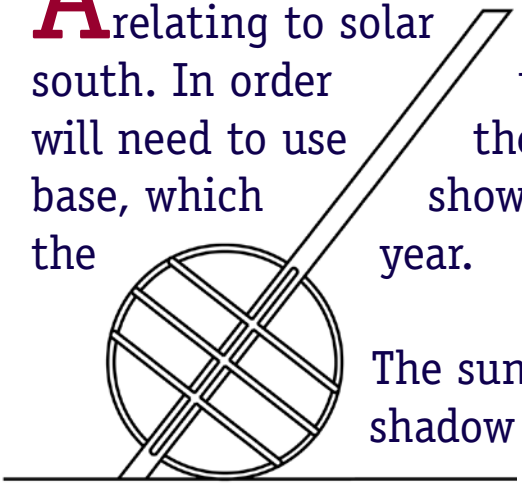
The time of Christ can seem very remote to us, but in the timescales of the cosmos, it is very close. Most of us have been close to others 50 years older than ourselves. We need only 40 overlapping lives to link us by word of mouth across 2,000 years ago. This closeness is represented by the forty linked hands that surround the sundial.

THE COMPLEXITIES of administering a state created the need for writing. This in turn allowed memory to be preserved in books. This was the greatest advance in human culture to date, allowing knowledge and ideas to be communicated across time and space.

Through the written word, the ideas of a small group of Middle-Eastern tribes spread around the world, giving rise to the three great monotheistic religions. The Jews, also known as the 'People of the Book', consolidated the core of their religious tradition into the five books of Moses, the Torah (the books of Genesis, Exodus, Leviticus, Numbers and Deuteronomy in the Christian Old Testament) probably around 500 B.C. Through the teachings of Christ, the core ideas in these books spread throughout the Roman world and beyond in the early centuries of the Christian Era. In the sixth century, Judeo-Christian monotheism was at the heart of the Islamic inspiration, which accepted the Torah, along with the Christian Gospels, as being the authentic revelation of God, though corrupted by the alterations of men.

THE SUNDIAL

AT ITS MOST SIMPLE, the sundial reads the hours of each day, relating to solar mid-day, the time when the sun is directly south. In order to derive the time accurately, however, you will need to use the table on the tiles on the East side of its base, which show you how much time to add for any day in the year.



The sundial face is arranged so that the moving shadow of the tip of the gnomon describes a straight line along the top of the face on the equinoxes. The innermost curved line on the face is the line described by the shadow when it is at its shortest, on midsummer's day. The intermediate curved line is the line described on Nano Nagle's memorial day, the 26th of April.

THERE ARE TWO corrections incorporated in the tables on the sundial base. Firstly, our time zone is fixed to the time at the Greenwich Meridian, the line of 0° longitude which passes through Greenwich in London. Because Ballygriffin is 8° 31.36' West of Greenwich, solar mid-day is 34 mins 5.4 secs later here, every day. The second correction, The Equation Of Time, is more complex, because it varies throughout the year and even to a small degree from year to year.

The earth's orbit around the sun is an ellipse, not a circle, so it travels faster when close to the sun (currently about 3rd Jan.) and slower when furthest away six months later. This leads to a variation throughout the year of the time of solar midday of about 30 minutes. An annual average of solar time at Greenwich is taken to derive clock time, hence the term Greenwich Mean Time.

The pattern of the annual variation of solar time is known as the 'Equation of Time' and can be represented as a graph, as is shown on the tiles to the West of the sundial base. Both the graph and the table show corrections derived for the year 2007.

The gnomon of the sundial is arranged to be parallel to the earth's axis. This means that it points due North, at an angle equal to the latitude of the sundial site. In this case, the latitude is 52° 09.05' North.

Three hoops surrounding the base of the gnomon represent the equator in the middle, with the Tropic of Cancer above and Capricorn below. At midsummer, the sun is at right angles to the ground at the Tropic of Cancer, and in midwinter at the Tropic of Capricorn. At the spring and autumn equinoxes, it is at right angles to the ground at the equator.

COSMIC WALK

Distance approximately 2km