EVOLUTION OR DESIGN

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SCIENCE , RELIGION AND THE THEORY OF EVOLUTION

Just over two hundred years ago there was a revolution in France. For centuries, the State and the Church had oppressed the people. The Counts had forced them to work for free. The Abbots had tithed their produce. The Kings had spent their taxes on wars and palaces. It was time to overthrow authority, and set people free. “Liberty, equality and brotherhood” was the cry. And the heads of the nobility rolled into the baskets of the guillotine.

The effects of the French Revolution spread outwards like the ripples on the lake when you throw in a pebble. Though not always so bloody in other countries, the theme was the same: why listen to out-moded priests when they tell us how to worship a God we cannot see? Why obey a ruler who thinks his descent from a particular family entitles him to instant obedience? Do we not have the freedom to decide for ourselves what to believe, and make our way up in the world?

This nineteenth century ‘renaissance’ included a rejection of belief in the Bible. The first chapter of Genesis says God created life on the earth in one week, and Christians had always accepted this as a fact. But now fashionably liberal thinkers asked whether we have to accept the supernatural. Could not natural forces alone have produced living things, simple at first, and then growing more complex with time? Do we actually need a God? It was **Charles Darwin** who assembled this thought into a coherent theory, seeing animals and plants as related to each other by pathways of ascent from earlier and simpler

forms of life, like a tree with many branches. The common ancestors had disappeared in the distant past. But there was a trail of clues left behind in the fossil record, and repeated in each generation in the phases of development of an embryo, which, it was claimed, could be interpreted as a record of upward progress. Given time, said Darwin, the pressures of natural selection would refine the adaptation of each species to its niche in the environment. Competition with other species and changes in conditions would prune out the unfit. Any minute changes that helped the survival of a species would be retained. So, by the survival of the fittest, he claimed, we have arrived at the amazing range of plants, animals and insects that populate the globe, from the birds that inhabit the sky to the giant molluscs at the bottom of the oceans.

In the world of Queen Victoria, men of science were bringing huge improvements to mankind. Vaccines to conquer childhood illnesses, steam engines that could rush a trainload of passengers to the other end of the country, electric light, X-rays, flight, the telegraph – there was no limit to the triumphs of the human brain. This progress fitted Darwin's theory. Man was in charge of his own destiny. As the very pinnacle of evolution, he would eventually bring about a world where freedom, health and happiness would prevail.

That optimism was shattered by two world wars. Pollution, destruction of the environment and imminent climate change have tarnished the image of the men in white coats as saviours of mankind. But the dogma that science can explain the origin of life prevails. Our children are taught in school that evolution is a fact. Brilliant TV programmes by wild life experts such as David Attenborough hammer home the message that evolution has produced an amazing variety of creatures, each perfectly adapted to its perch on

the evolutionary tree. No teacher or biologist dares challenge the official line.

One hundred and fifty years of Darwinism have left us feeling that there is an impassable gulf between science and religion. The humanists – people like the outspoken Richard Dawkins – openly deride the idea that God is in charge of the world. They see religion as outdated - a prop to comfort early man as he faced a hostile world. Science, they say, has entirely removed the need for a God. But is this true?

By definition, the Greek word from which we derive 'Science' means 'knowledge'. Human knowledge is dynamic. It is always changing, adapting to new findings that challenge the old ideas and result in adjustments that can be quite drastic. Fifty years ago, for example, food scientists argued fiercely that white bread is just as good for you as brown. Nowadays, they view the fibre content of wholemeal bread as being a vital part of our diet. Science only represents the sum total of knowledge at the present time. It is open to challenge.

How does science progress? In summary, it observes facts about a topic, gathers them together, and looks for a pattern or relationship between them. It then suggests that there may be a rule that links them together. This suggested rule, called a **hypothesis**, has to be tested by experiment. Scientists in different establishments will repeat the same conditions, and see if they observe the same results. If they do, and there seem to be few exceptions to the rule, it is elevated to the status of a **theory**. However, if new facts arise which contradict the earlier findings, or someone thinks up a more satisfactory hypothesis which has fewer exceptions, the theory may be revised or

replaced. Only when a theory has been unassailed for a long time, and seems to fit all cases, does it become a **law**. For example, Einstein observed a connection between energy, mass and the speed of light, and suggested a relationship - his famous equation, **$E=mc^2$**. His general theory of relativity still stands, although many recent attacks have been made upon it, and it may one day be replaced. The theory of evolution has also been modified many times, as exceptions have been found to Darwin's rules. His basic 'evolutionary tree', for example, has had to be chopped down in the last few years, because advances in the study of genetics have shown that many of the connections between species that were based on their appearance were false. The newly available studies of DNA, the genetic code that defines a living creature, have made very different links.

When we come to consider the origins of life on the earth, we are in a different situation to traditional science. By definition, life only commenced once. There were no human observers at the time to record what happened. The facts are missing. We can look at the relationships between living things today, and draw up a theory about how they came into existence, but ***it is not possible to test the theory*** by repeating the conditions in a laboratory, because we do not know what the conditions were. If an alternative explanation seems to us more credible, we are perfectly at liberty to champion that cause, because nobody can ***prove*** anything. The study of the origins of life is not true science, like discovering the laws of physics or chemistry or mathematics. It is guesswork.

DNA – THE CODE OF LIFE

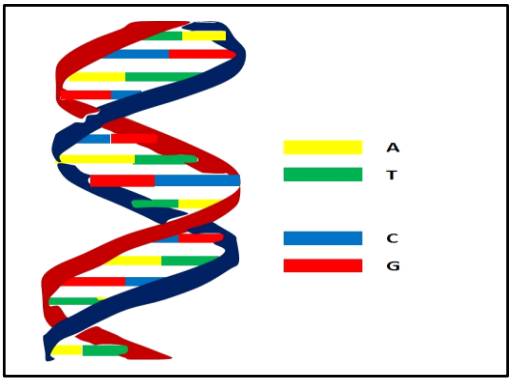
Some brave biologists have dared to stand up and reject the theory of evolution. These are not all religious people. They simply do not feel convinced that evolution can explain the complexity of life on earth. They do not see the evidence for upward change, from simple to complex forms of life. There is plenty of evidence for a species adjusting itself to changes in the environment or increased competition, like the finches that Darwin observed in the Galapagos Islands, or the moths that became darker in smoky industrial Britain. But for evolution to hold true, there has to be more than that. There has to be a progression outside the species, from primitive virus-like organisms to one-celled creatures, and then upwards to mammals and fishes and birds. The fact that both simple and complex forms exist side by side today does not prove that they had a common origin. They are each perfectly suited to their own niche in the ecological pyramid, which needs simpler organisms in vast numbers to feed and to recycle the dead bodies of those higher up the chain. The evolutionary links are conjectural, and the evidence for the intermediate forms of life as development 'progressed' into the modern forms is missing. In other words, the time-worn 'tree' has many branches, but the trunk is not there.

One huge problem with evolutionary theory is how such big changes could take place at all. For all living creatures, the link between one generation and the next is **DNA**, the amazing code that describes every feature of an individual. Criminals have become terrified in recent years when traces of their DNA left on the scene of a crime have been picked up by police investigators, sometimes years later, and used to incriminate them. What exactly is DNA? We

have become used to talking about 'digital' information – digital television, digital sound recording and digital cameras. What we mean is that a detailed description of the sound or picture is being held as a string of standardised units with spaces between them, which can be re- assembled at the other end into an identical chord or photo. Older readers will remember Morse Code. This was a system for transmitting words by wire or radio. Each letter of the alphabet was represented by a series of dots or dashes. A dot on paper became a short sound on the radio, and a dash a long sound. Thus the letter 'S' was dot, dot, dot, space, and the letter 'O' dash, dash, dash, space. So if a coastguard heard on his headphones "··· -- - ···" he knew someone was sending out the international appeal for aid, SOS, or "Save Our Souls". Instead of a dot and a dash, modern computers use 'switched on' or 'switched off' as the two alternative symbols. These are built up in sets, followed by a space. Enormous strings of these, stored on a rotating hard disk or a DVD, are used to define the first chord of a Mozart concerto, or the top left corner of a picture of Mona Lisa, or the text you are reading now. Lately we have grown used to tiny plastic cards, inserted into our camera or mobile phone, storing huge amounts of digital information – five hundred pictures, or one thousand songs.

Well, long before the digital age began, an incredibly more sophisticated system of information storage was being used inside every living cell. In living cells, instead of ***two*** alternatives ('off' and 'on'), there are ***four*** alternatives, because the information string is made up of sets of four different bases (nucleotides) With four alternatives in each row instead of two, the number of possible combinations for each rung rises from four to sixty four. This is a huge jump in efficiency in storing data. And to pack even more into a small space, the ladder, which has millions of rungs

(it has been calculated that in each human cell the total length, stretched out, would be a metre long) is then twisted into a tight helix, like the springs in an exercise machine, and packed into a jacket called a **chromosome**. So efficient is this four-fold storage system that it has been calculated that it could store all the books that have ever been written in the space occupied by a pin head. In fact,



FOUR ALTERNATIVE BASES FOR CODING

in every cell of your body is a complete definition of you as an individual, right down to the size of your ears and the dimple on your chin, plus information to tell you how to suckle your mother's breast within minutes of being born, and how to walk, and run, and reproduce.

When the time comes for a daisy or a man or a bed bug to reproduce, this string of information has to be passed on to the next generation. In simple one-celled organisms the chromosome creates a mirror image of itself, like the clay mould used to cast a bronze sculpture. This mirror image (called **RNA**) is then used to create two identical copies of the original string, with all the proteins set out in the same order, after which the original cell splits into two. In mammals like us the process is more complicated, because information from our father is mixed up with information

from our mother before the germ cell divides, giving the possibility of more variation between one generation and the next. However, in both cases the system for division and re-assembly is extremely reliable, and only very rarely will bits of the chromosomes be lost or damaged, leading to death or disability. In fact the ***only*** possibility for change to occur between one generation and the next is through a drastic re-arrangement of the protein blocks themselves. This can happen through exposure to radiation, or powerful chemicals, and is called a **mutation**. Mutations are quite random, and usually result in a loss of something that was there before. For example, the progenitor of today's egg laying hen was the Jungle Fowl of Borneo. The male Jungle Fowl is a very colourful individual, and the female is camouflaged with spots on her feathers. But over the centuries of domestication, mutations have resulted in a loss of colour, so that modern hens are plain brown or white. Mutations are generally harmful. A white hen is fine in a farmyard, but to lose her colour would make a wild Jungle Fowl stand out as she sat on her eggs, betraying her position to her predators. Cancer cells can be mutations, and so are diseases like sickle cell anaemia. Fortunately the body has repair mechanisms that can identify and correct or eliminate most mutations so that they do not survive.

The important point is that over thousands of years (and the evolutionist claims millions of years) the system of reproduction by replication and division has protected each species from change. Bees have been found trapped in beads of fossil amber which are identical to modern bees. Darwin assumed that if a new, useful characteristic arose in one generation it would automatically be passed to the next. But modern genetics shows that the whole system tends to preserve the status quo, and most mutations are deleterious. This does not leave much scope for an increase in

complexity. Small changes are possible, because within the gene pool of each species there are variations which will permit a moth, for example, to become darker or lighter in a particular area. But it still stays a moth. It does not change into a new species.

Before we leave this topic, we need to consider how this incredible system for recording information came about in the first place. Even primitive forms of life such as viruses have the same DNA system. The four 'code' proteins which are arranged on the rungs of the ladder are similar to other proteins which make up the body of the individual plant or animal. But it is the arrangement of the code proteins into the ladder shape that provides the instructions to make that body. The DNA helix is like a computer programme. When read off from one end, rung after rung, it instructs the very first cell formed after the human sperm fuses with the egg in the womb to divide and divide. Somehow (the mechanism is not understood) certain of these new cells are then directed to read off from their information string the instructions to cluster together and create, say, a liver cell, or part of the heart, or the lens of the eye. Within seventy two hours, the basic parts of the body have already been laid down.

Let us say this again. Without this information string, the most primitive form of life would not have been able to reproduce. All proteins, including the 'code' proteins, are built up from **amino acids**. Think of an amino acid in terms of the Lego bricks we used to play with as children, clicking them together to create shapes. The bricks come in three colours, say yellow for nitrogen atoms, green for oxygen and blue for hydrogen. Each amino acid is a string of atoms of these three elements arranged in a particular shape, and each shape has its own characteristics. Let us suppose

in conditions of warmth, in an environment with a range of atoms, perhaps in a deep sea volcanic vent, certain nitrogen atoms came to fuse with hydrogen atoms and oxygen atoms to produce an amino acid. Imagine perhaps a whole soup of different amino acids (a recent study suggested a minimum of 149 specific amino acids are essential to form the simplest unit of life). What would persuade four proteins to link together in a ladder formation, with sugars (these would have to have thrown themselves together at the same time as the amino acids) to provide the side pieces of the ladder? And what would be the point of this complicated assembly, unless the order in which the four proteins were arranged along the rungs had a meaning? And if somehow it had some sort of meaning, without the copying system (RNA) developing in parallel to read and duplicate the original, the whole edifice would die out the first time it came together. The evolutionist at this point usually says "Well, it is here now, so it must have happened!" But that is not logical. An independent mind, examining such a brilliant system of information recording, would normally exclaim "This is a masterpiece of engineering!" It is not our experience that such devices come about without an intelligent designer who has thought it all through. After thousands of years, the nearest our IT (Information Technology) specialists have come to it is the SD card in your camera. That is clumsy, by a factor of millions to one, compared with this minute mechanism that drives every cell in your body, and runs it for a lifetime, and directs it to reproduce before you die, so that there can be a son or daughter to take your place. What we are saying is that the most basic unit of life is so complex it demands a Designer. The Bible says that designer was the Lord God. The record in Genesis chapters one and two is a summary. It does not tell us how God did what He did. It just says he took the dust of the earth, and built it into

man, and then breathed into the inert body the breath of life. Only in the last century have we been able to decipher what goes on inside the cells that make up that remarkable body.

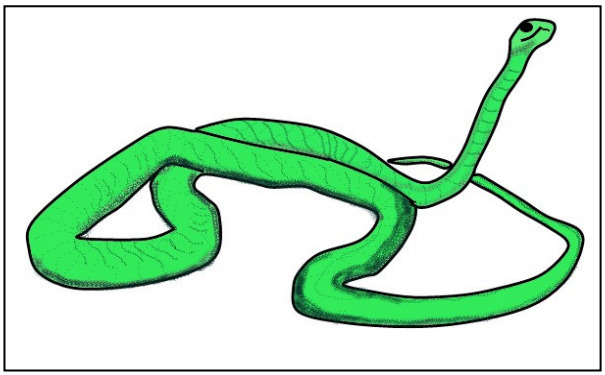
THE BLACK MAMBA

This approach, examining the mechanisms found in some of the amazing creatures and plants that populate the globe and asking "could these have come about by chance mutations?" is often called "**The Design Argument**". It requires no deep technical knowledge. It is the approach of a child, questioning the world in which he or she finds himself. Sometimes a child can see the wood, while grown-ups with university degrees are busy focusing on trees! Jesus said that unless we have the faith of a child, we cannot enter the Kingdom of God.

What we propose to do now is to look at some fascinating examples of the way plants and animals live and reproduce, and then ask the question – "could this have evolved?"

Our first case is a scary one. The **Black Mamba** is a venomous snake which inhabits Africa. It can grow up to 4 metres long. It is actually green in colour, but has a black lining to its mouth. The Mamba is quick to defend itself, and will rear up high and lash out with its poison fangs at anyone who comes close. It is also able to move across the ground at 14 miles per hour (20 km per hour), which is as fast as a man can run. It strikes many times, forcing large amounts of venom into its victim. The venom is a powerful neuro-toxin that stops the heart b e ating, so that the victim dies rapidly from respiratory failure unless an anti-toxin is injected within

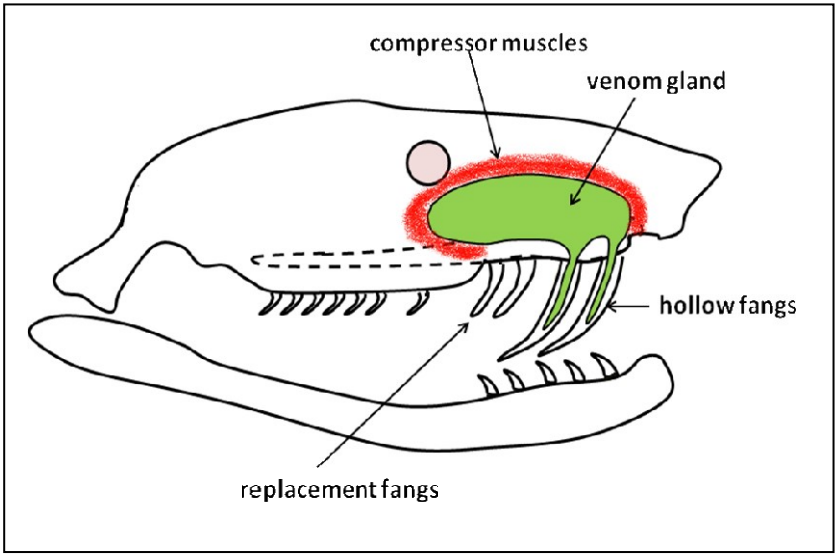
minutes.



Black Mamba venom is a clear fluid, made and stored in two chambers in the top of the skull. Each chamber is connected to a long, curved fang that is hollow, with a small hole in the tip. When the Mamba strikes, powerful muscles surrounding the venom glands contract, forcing the fluid through the hollow tooth into the flesh of the victim, where it is rapidly absorbed by the blood stream and transported to the heart.

The venom contains a mixture of specialised proteins. The most potent of these is a molecule (unique array of atoms) called dendrotoxin which is built up from 59 different amino acids, held together with bonds containing sulphur. This targets the central nervous system, and stops the nerves transmitting their signals. The victim literally dies of suffocation, as the lungs stop inflating and the heart ceases to beat. Other proteins in the fluid help to speed up absorption of the venom.

An interesting point is that the long hollow fangs are easily damaged in use, especially if the victim struggles. It has to be remembered that the venom is normally used to



provide the Mamba with its dinner. It only strikes humans if it feels threatened. Usually, it is hapless rodents or birds that are lanced by the snake, and once their struggles are over, it eats them. Now, if the snake were to lose one or both of its fangs, it would soon starve to death. Amazingly, it has a pair of replacement fangs already queuing up behind the active ones, ready to connect up to the poison gland and take over if the previous one breaks off.

Let us ask some questions. First, how did the Mamba's ancestor develop this powerful nerve poison? As we have seen, the proteins that make the venom lethal are very complex, built up from dozens of amino acids coupled together in a specific order. How could such a potent molecule arise? It was once thought that the saliva of the

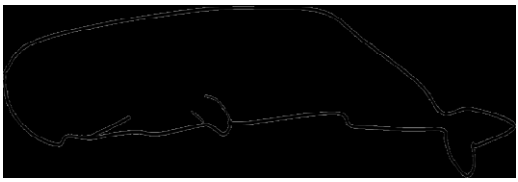
snake became toxic, but the latest research shows this is not so. There are indeed similar shaped but non-lethal proteins in the liver and other organs. But even if these were transplanted by mutation to appear in the head, they would have to be 'tweaked'. Until the very last of the dozens of amino acids that make up the toxin molecule has been clipped into the correct place, the molecule would not become toxic. Up to that point, the precursor of the dendrotoxin would not kill anything. The snake would be developing cells in its head that secrete a protein with no practical use. And even when the venom became toxic, the fluid, as a fluid, would be ineffective without a surrounding sac of strong muscles and a hollow fang to inject it into the body of the victim. How does a hollow tooth arise? The evolutionist would say that the earliest snakes had solid teeth. How does the change take place? Can a mutation or a string of mutations create even a groove in a straight line down the outside of a tooth, let alone a hole down the centre (remember, such changes must be random and without a pre- conceived purpose). And how does the new hollow tooth connect up to the venom sac? And without the powerful muscles also being there to force the toxin into the wound, how will the hollow tooth inject enough toxin to immobilise the victim? And what happened in the millions of years before the replacement teeth, sliding into place after one gets broken, managed to connect up to the venom gland without leaking?

The point is, until the whole apparatus is present and correct, it cannot function. The toxin and the delivery system have to develop in parallel. A human brain, given time and the right materials and laboratory facilities, might research a chemical compound that would neutralise the nerves of mammals or birds. It might even design a delivery system, complete with backups. But evolution has no brain. There is

no designer. Or is there? For some of us, the argument for a Creator is compelling. We cannot see these wonderful systems coming together purely through mutations and natural selection. The probability of such a thing happening unguided would require more years than the life of the universe.

THE SPERM WHALE

From the African jungle now to the depths of the ocean. The whales are the most majestic of all living creatures. Their power and sheer size, the distances they can travel, and their ability to communicate with each other over hundreds of



miles, fill us with awe. But one of the most impressive of all is the **Sperm Whale**. The male sperm whale is the largest hunter ever known. It can grow up to 20 metres (60 feet) long, and weigh 50 tons. It also has the biggest brain (six times the size of ours), and can make the loudest noise of any living creature (it makes clicking noises rated at 230 decibels at 1 metre – louder than a rifle shot).

This particular whale finds its food at the bottom of the ocean, up to a mile (1600 metres) below the surface, in regions of darkness and extreme pressure that humans can only explore by remote controlled submarines. It lives on giant squids. These huge octopus-like creatures have long tentacles, with suckers as big as dinner plates, as evidenced by the wounds found on the sides of sperm whales that have survived battles with their mighty prey. A

sperm whale needs to consume at least a ton of squid every day.

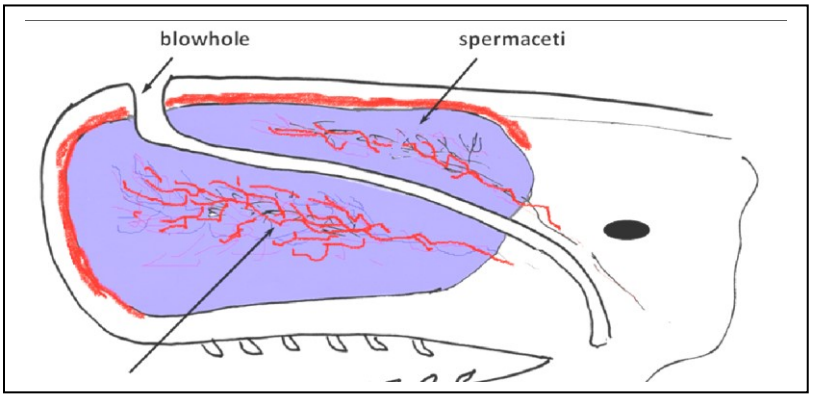
How can the sperm whale go down to such enormous depths? And how can it find its prey in utter darkness? A human diver with an air supply can only reach 300 metres before his lungs collapse. Even then he has to spend days in a decompression chamber before he can return to the surface, otherwise he dies from the compressed nitrogen in his blood bubbling into his tissues. But sperm whales go down to at least 2000 metres (they have been found dead from tangling in telegraph cables on the ocean floor), and they make the trip several times a day. Let's follow a sperm whale as she finds her breakfast.

Before she sets off, the whale spends ten minutes filling her tissues with oxygen by sucking in air through the blowhole on top of her head, five times a minute. In front of her skull, where our nose would be, she has a huge rounded bag filled with three tons of a milky wax-like substance called **spermaceti oil** (hence the name Sperm Whale). Around this bag and under the skin next to the cold water is a thick complex of blood vessels. By diverting blood to this network, the spermaceti is cooled, and as it does so, it solidifies and becomes denser. This means that the whale as a whole begins to sink. It loops under the water, head first, and swims straight downwards for quarter of an hour at a steady three and a half miles an hour. The pressure surrounding the whale is now 100 times atmospheric pressure (1400 pounds per square inch). At this depth our lungs would be crushed to a pulp. The whale's, however, are used to this, and her rib cage collapses without harm. She just holds her breath, and shuts off blood from the extremities of the body to save oxygen. The temperature is 2 degrees Celsius, and no light penetrates

from the surface nearly a mile above.

To find her way around, our whale switches on her sound- locating system. This operates on the same principles as the radar used for landing aeroplanes at night, or the sonar in a submerged submarine. She sends out a pulse of high- frequency clicks from a resilient set of lips located part way down the windpipe. These sound bursts pass out through the rounded bag of oil above her upper jaw, which focuses them into an intense beam of sound, just as the rounded lens on a lighthouse lantern shapes a pencil of light that flashes across the sea. When this pencil of sound hits a solid object, the echo returns in a fraction of a second, and is picked up by a special oil-filled tube that faces forward at the tip of the lower jaw. The returning echoes pass through the oil, and stimulates nerve endings in the middle ear that build up a picture in the whale's brain, just as our brain translates the signals from the nerves in the retina of our eye. It is likely that as she swings her head, she builds up a three dimensional picture of her surroundings, including moving objects like squids. We know that as she nears her prey, the clicks increase in frequency until they merge into a buzz. We also know from experiments that dolphins, which have a similar echo-location system, can swim at high speed through a mesh of wires not much wider than their bodies, and distinguish between a coin and a disc of the same size made from plastic. Her lower jaw hinges down with a three metre bite to scoop up a squid. The giant squid including its tentacles can be as long as the whale herself, but smaller squids are also taken. The sperm whale eats three percent of her body weight in squids every day - the numbers taken are enormous – the horny beaks from fifteen thousand have been found in the stomach of one whale.

After half an hour or so, the whale needs to return to the surface to breathe. Pumping blood through the bag of spermaceti, she warms it up, and it turns from solid to liquid, lowering her density so that she tends to float upwards. Swimming steadily upwards, she breaks the surface and



'sounds', that is she puffs a great plume of steamy air out of her nostrils, and begins to breathe in and out every 12 seconds to eliminate carbon dioxide from her blood. After a rest, she returns to the bottom for more squid.

It is time for some questions. The most obvious difference between other whales and the Sperm Whale is the enormous, bulbous bag of spermaceti oil in its head, which makes up a quarter of the entire length of the animal. The Sperm Whale is the only whale which can forage for its prey at the bottom of the ocean. It is the only one with spermaceti oil. There is obviously a connection. For over a century these huge, harmless, intelligent beasts were slaughtered in thousands to obtain the oil to burn in lamps, and for processing into wax for candles and polishes and cosmetic creams. Why does the whale need such a lot of it? What is

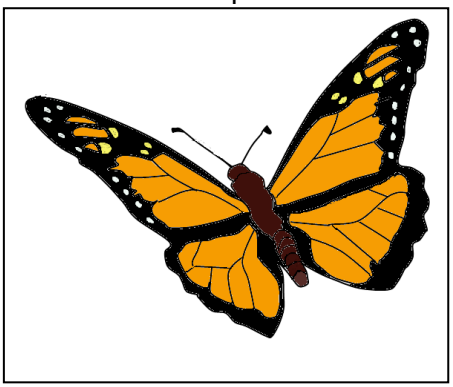
so different about it? The answer lies in the unusual properties of this remarkable substance. Spermaceti oil has the property of changing from a liquid to a solid just below the normal body temperature of the Sperm Whale, at 32 degrees Celsius. As it solidifies it becomes denser, that is to say, the same volume of material becomes heavier. Because there is such a large quantity of the oil, this makes a big difference to the overall density of the whale. So, by precisely controlling the temperature of the oil, either pumping blood through the oil to warm it up, or pumping it around the oil and close to the sea water above the skin to cool it, the whale can position herself in the water without effort at any depth she chooses. She can achieve neutral buoyancy over a huge range of depths.

The question is, how did the Sperm Whale evolve this amazing oil, which changes state precisely around its body temperature? It is not found anywhere else in nature. Did one cell in the head of an ancestral whale mutate one day and begin to secrete oil? What use would it be, alone? Only when there are big quantities can the oil change the overall density of such a large animal. And how was the formula for the oil tuned, so that it would change state at just the right temperature? Were there millions of failed attempts before the perfect oil came along? And the oil, alone, is no use without the blood pumping control system to change its temperature. At body temperature it is just aoil, and has no useful effect on buoyancy.

A human brain might invent this novel approach to depth control, and research the ideal liquid for the purpose, with trial and error and millions of dollars of cost. But surely such a brilliant solution to the problem could not have come about by chance? We can set a goal and work towards it. But evolution has no goal. Any changes have

come about without a purpose.

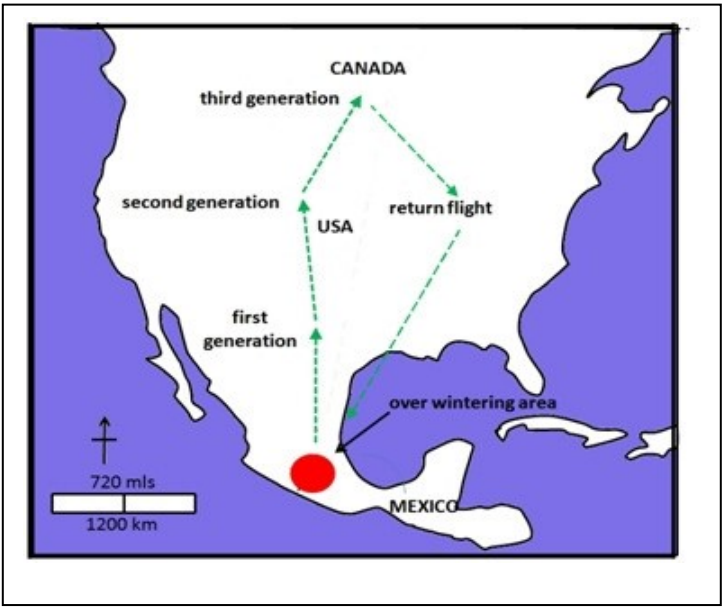
THE MONARCH BUTTERFLY



For our next topic we cross the Atlantic. There is a huge range of butterflies in the world. All of them start off as grubs. They turn into a chrysalis, hatch out into a flying insect that feeds on the nectar of flowers, and eventually mate and lay eggs. Many are beautiful to look at, and some have amazing camouflage. But few are as impressive as the Monarch butterfly.

The Monarch is found across a wide band of the United States and across the border into Canada. It is about 10 cms (4 inches) across, and gold in colour with black markings. The caterpillar feeds exclusively on milkweed plants. The sap of this weed is poisonous to other creatures, and the toxins persist after the caterpillar has turned into a butterfly, so that the Monarch's bright colours warn birds not to eat it. The unique feature of this butterfly is that it migrates. Every spring vast clouds of Monarchs spread northwards up the east side of the USA, drinking nectar from the flowers of milkweed and other plants. After one or two months they mate and lay eggs on milkweeds, which hatch into stripey grubs. These feed and grow, and after a fortnight turn into a chrysalis which hangs from a leaf. After another fortnight this breaks open and a new butterfly emerges, which continues to fly north, seeking more

milkweeds. This cycle is repeated several times through the summer, each new generation pressing on northwards until the last hatching may reach the Canadian border.



But as the temperature begins to drop, this last generation turns south, and begins to fly unerringly back down the continent, not stopping to breed, but heading down and down, eventually crossing the border into Mexico. In the case of those Monarchs flying south from areas on the east side of the States, their flight path actually takes them across the Gulf of Mexico, and they fly across the ocean, out of sight of land.

The reason for this migration is that the Monarch cannot survive a frost. It has to find somewhere warm to spend the winter. So all the Monarch butterflies from the east side of America, millions of them, gather together into one small area of about 200 square miles of Mexico. They do not

breed there, but spend the winter months congregating on the leaves of oyamel fir trees, which grow as mountain forests in this area. But once the spring returns, the urge to migrate returns, and the winter population, now up to seven months old, begins the return flight north.

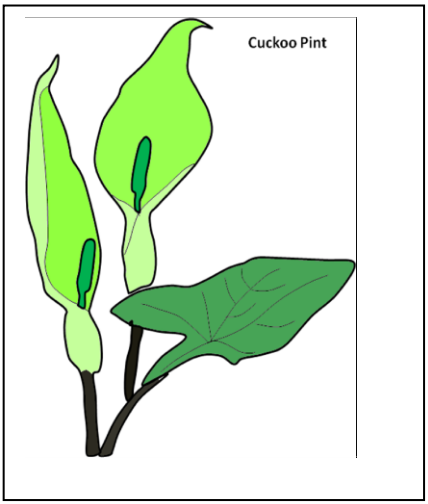
The extraordinary feature of this migration is that it is not the same butterfly that travels north and them comes south again. It is the third or fourth generation from the original brood that decides it must hurry south for the winter. The distance flown by the butterflies from the far north is up to 2000 miles (3300 km).

Once more, we must seek some answers. How could such an enormous migration begin in the first place? It is hard to imagine it would start by butterflies exploring northwards from Mexico, because milkweed is not abundant in Mexico itself. The Monarchs do not feed while they are there. On the other hand it is difficult to see butterflies from the USA seeking to escape the frost in Mexico, a huge distance away, without knowing it was there. And why does this particular butterfly migrate, when others hibernate in the place where they grew up? And how does it navigate over such enormous distances? The answer to this last question seems to be – by the sun. In experiments, Monarchs in migration phase have been tricked by mirrors to see the sun from an unnatural direction, in which case they adjust their angle of flight to suit the new 'position' of the sun. They even take into account the apparent daily movement of the sun round the sky, and if the wind blows from one side, they adjust their track to compensate, just like the pilot of an airliner. But how does the butterfly in the north know which direction to take? And why do the first and second generations to hatch fly north, and only the third or fourth generation turn south? The answer must be that the

genetic code in their chromosomes commands the generation experiencing shorter or cooler days to set off south, and that the 'map' for the long journey to Mexico is already imprinted into their brains (the brain of a Monarch is smaller than a pin head). They are like robots, following a computer programme. But the analogy cannot hold, if evolution is true, because there was no one to write the programme. Here is the real dilemma. It is an accepted principle of biology that acquired characteristics cannot be inherited. If one more adventurous Monarch (or its ancestor) began to explore outside its normal territory, found better supplies of milkweed, and then learned to fly back to where it started off, this new knowledge would not be inherited by the next generation. And in any case, there is a three generation gap between the start and the finish of the Monarch's migration. It is easier to postulate a super-intelligent Designer who, working at the need to control milkweeds, too poisonous to be eaten by animals, devised this beautifully coloured creature to keep them in check, and at the same time give pleasure to so many people each spring.

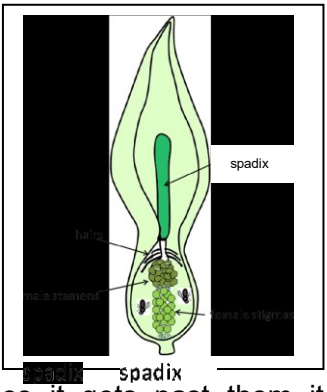
THE CUCKOO PINT

Our next example is a plant. The Cuckoo Pint belongs to the Arum family. It is a common resident of damp English hedge bottoms. Its arrow shaped leaves, covered with dark blotches, emerge above the soil in the spring. Next to follow is a rounded striped green sheath, from the centre of which projects a tall, dimpled, rod. The whole plant is poisonous, especially the bright red berries which form in autumn. If you were expecting to see a beautiful, sweet smelling



flower on this lily-like plant, you would be disappointed. It does not seek bees and butterflies to fertilise its seeds, but flies, especially the kind of flies that breed in foul smelling sewage. Accordingly, it has an ingenious system to ensure the transfer of the male pollen from one plant to the female stigmas of the next one.

For a few days the poker-like rod that projects from the heart of the plant secretes a powerful smell of bad meat. The attraction of this smell for flies is heightened by the fact that the rod (called the spadix) is actually many degrees higher in temperature than the surrounding air, just as rotting material usually heats up.



When a curious fly catches a whiff of this warm, ripe smell, it lands on the sheath and makes its way downwards into the cool interior of the flower, expecting to find a good place to lay its eggs. It has to push its way past a ring of downward-pointing hairs, but once it gets past them it finds it cannot get out again. In the base of the flower are the female stigmas. As the fly bumbles around, it transfers onto these any arum pollen that it has brought in on its back.

After a day, the stamens (the male, pollen bearing part of the flower, sited just below the ring of hairs), become mature, and dust the fly with this plant's pollen. On the third day, the ring of hairs withers rapidly, and the fly discovers it is free to fly away. However, there is a strong probability it will be deceived by a second Cuckoo Pint, and be caught again, so passing on the pollen from the first flower to this new one.

There are several questions we must ask about this strange flower. Firstly, the bad smell. Most plants have a sweet smell, but this family does not need insects that seek nectar. Scientists have analysed the molecules responsible for the smell in a similar arum called Helicodiceros muscivorous. This arum attracts blowflies. Using gas chromatography (a procedure for identifying chemical compounds) they found three sulphur based compounds (dimethyl monosulphide, dimethyl disulphide and dimethyl trisulphide) in the arum smell, which are identical to those found in bad meat. In tests, blowflies were completely unable to distinguish between the arum imitation smell and the genuine bad meat smell. How does a plant come to create a molecule which has nothing to do with plants, and quite different from the smells which normally attract insects, but just perfect for blowflies? And what about the high temperature of the spadix (it can be 20 degrees Celsius higher than the surrounding air)? It has been shown that the plant burns fats to generate this warmth, in a complex chemical reaction - just to enhance its attractiveness to its involuntary helpers. And how did the three day trap system evolve, with the downward pointing hairs living just long enough to confine the flies until they have been thoroughly dusted with pollen? Again, we marvel at a system for reproduction that is perfect for its purpose, but which includes three separate elements which are all

essential to success.

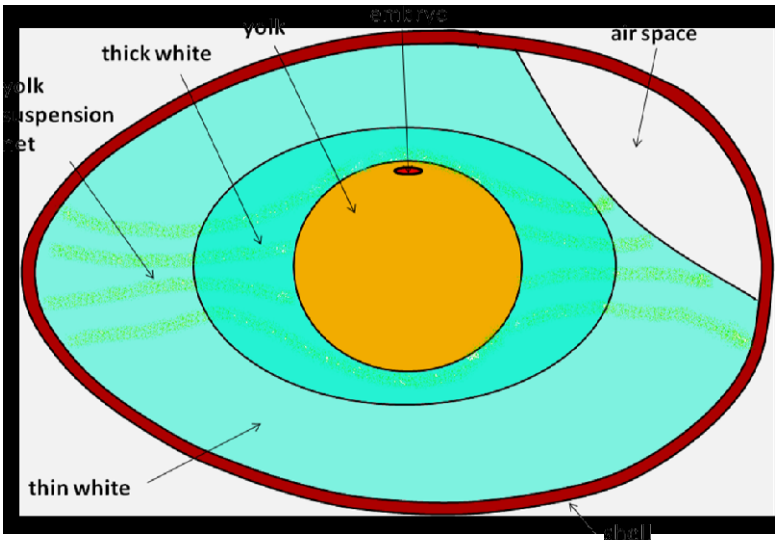
THE STORY OF THE EGG

As we crack open our boiled egg on Sunday morning we may forget that the egg was meant, in the first place, to be the home of a baby chicken. Inside that smooth shell was a complete food supply and life support system. In three weeks it would take an embryo all the way from its first living cell, formed by fusion of the sperm from the cockerel with the ovum of its mother, right through to hatching as a run-about, cheeping chick. Most embryos develop inside the mother's body. They do not need a separate food supply, because they receive nutrients from the blood stream of the mother. Similarly, they obtain oxygen from her lungs via the placenta (disc attached to the womb lining), and excrete carbon dioxide in the same way. With birds it is different. The whole period of gestation takes place outside the mother's body. The egg has to start off with a package inside the shell of everything the embryo will need during those twenty one days – food supply, breathing equipment, protection from shock and hostile bacteria, etc. It can be likened to the capsule on the end of a space rocket, which also has to contain everything needed to support the astronauts for the duration of their mission. Once the rocket has launched, it is not possible to go back for something that has been forgotten.

Once you begin to examine the contents of an egg, you are impressed with the business-like way inwhich all the requirements for survival have been met. Let us take some examples. During its development, the embryo has to create muscles, skin, nerves, blood and feathers. The nutrients needed for this purpose must all be enclosed in

the shell. Muscles, for example, are made up of proteins, which in turn are built up from amino acids. Fourteen amino acids are essential for a chicken (others it can synthesize (build up) for itself). All fourteen are present in the white of the egg. Fat soluble vitamins such as Vitamin A and D are found in the yolk of the egg, and B vitamins in the white. A major requirement during development will be the calcium and phosphorus needed to make the bones of the skeleton. There is a perfect source ready to hand in the shell of the egg, which is a mixture of calcium and phosphorus salts.

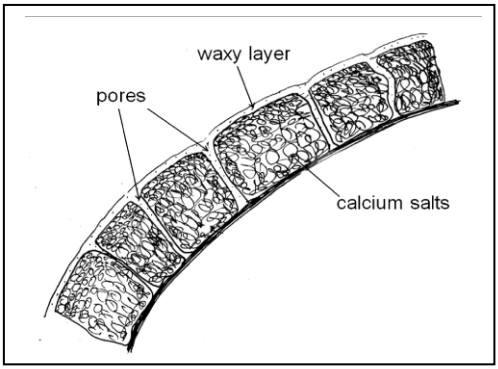
The astronauts in their capsule have to be safely strapped down in harnesses to protect them from vibration and



buffeting during take-off and landing. The chicken embryo is also safely suspended in the centre of the egg, attached to

the yolk, and surrounded by rubbery egg white. A neat cradle of protein strings, anchored firmly into the ends of the egg, surrounds the yolk like a football in a net, to ensure the yolk is free to rotate if the egg is disturbed. The spot on the yolk where the embryo grows is less dense than **the** rest, so the yolk rotates in its cradle until the embryo is uppermost, next to the warmth of mother hen sitting on her nest. Next time you crack an egg into the frying pan, look out for the remains of these strings – white bundles next to the yolk.

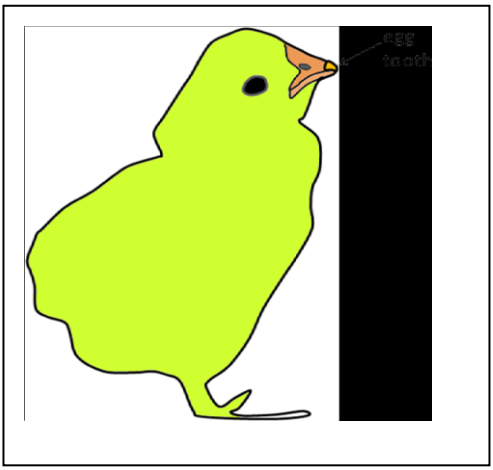
How does the embryo breathe? During the early days very little oxygen is needed. As the chick grows, a balloon-like membrane spreads out from the navel which is rich in arteries and veins.



This eventually surrounds the baby chick on all sides, and comes to lie next to the shell. The smooth shell of a hen's egg is made from tiny granules of calcium carbonate (chalk). However, viewed under a microscope it can be seen to be penetrated by thousands of tiny pores which are lightly plugged with a waxy film. Oxygen is able to diffuse downwards through these pores and enter the veins in the membrane below, from where it is carried back to the heart. Similarly carbon dioxide can work its way outwards from the arteries, leaving the embryo's blood free from poisonous gas. The waxy layer keeps out hungry bacteria, for whom the contents of the egg would be a perfect food supply. There is also an enzyme (a protein which speeds up chemical reactions) in

the white of the egg, called lysozyme, which attacks and destroys any bacteria that do happen to penetrate the pores.

A most interesting question is how the embryo escapes from the egg at the end of the three weeks. When the American astronauts splashed down into the ocean, the capsule had a hatch on the outside. This was opened by navy frogmen who released them and hustled them away in inflatable dinghies. But the chick has no such outside help. How can it break through the tough, unyielding chalky wall that surrounds it? (Think how hard you have to tap with your teaspoon before the shell begins to crack). The answer is that three days before hatching the chick turns around in the shell so that its beak is pointing under its right shoulder towards the large end of the egg. This end is hollow, with a split in the outer membrane that encloses a big bubble of air (you can see this if you tap your egg on the large, not the pointed end). The beak at this stage is quite rubbery, like the bridge of your nose. It would never penetrate the shell. However, in the last days a small, tough cap called the egg tooth develops on the tip of the beak. This falls off after the chick is a few days old. On the twentieth day the muscles on the underside of the neck begin to contract spasmodically, driving the beak through into the air space. Here it can take in oxygen from the air there, and the lungs begin to inflate. The



chick can be heard cheeping
inside the egg at this stage, even though the shell is unbroken.

With renewed strength, the egg tooth is hammered against the inside of the shell until it is punctured, and a small crater appears on the outside. Shuffling with its feet against the inside of the shell, and pecking away, the chick slowly cuts a trail around the egg, like taking off the end of a can with a can opener. Eventually it thrusts off the large end altogether, and crawls out, to lie drying out in the warmth of the mother hen's feathers.

One last amazing fact. The yolk of the egg is made up of thousands of globules of oil, enclosed in a membranous bag. Oil is rich in energy. The embryo needs very little energy while it is enclosed in the egg – its mother provides it with warmth, and it does not have to use its muscles very much. After hatching, though, it needs lots of energy to run behind its mother to find food, and escape from predators. Well, just before hatching the whole yolk is drawn inside the abdomen through the navel, and the hole heals over. The newly hatched baby now has a built-in 'petrol tank', rich in energy, already in place to keep it going for at least three days!

O.K. It is time for those questions again! We made some comparisons between the egg and the space capsule on the moon rocket. Each has to provide a safe and reasonably comfortable environment for a long period where there is no access to the outside world. Each has to provide food, oxygen, protection, and a means of escape at the end of the journey. But the moon rocket was the culmination of years of research by the best brains in the world. President Kennedy vowed to put men on the moon, and millions of dollars were

spent to accomplish this target. Separate teams were set up to design the space suits, the capsule walls, the propulsion rockets, the control systems, the food and waste disposal arrangements, the harnesses and seats. A Project Coordinator had the responsibility of chivvying along the teams, deciding on priorities, bringing in new scientists where there was a problem. There were many test firings, spread over several years, before the first men were allowed on a mission. After each one, the results were scrutinised, weaknesses noted and corrected, and adjustments made. Only when all the teams were satisfied with the reliability of their share of the project – medical, life support, propulsion, guidance, communications - was the go-ahead given for the first rocket to the moon.

But in the case of the chicken and the egg, there were no design teams, if evolution is true. Every small adjustment came about through trial and error. The problem with this idea is that there are too many things that need to be perfected *at the same time.* You could finally arrive at a perfect menu for the yolk and the white, adding every one of the 14 essential amino acids, after many earlier failures when just one was missing and the embryo died. But the embryo also needs oxygen. If the early versions of the shell were *solid* chalk, the embryo might have plenty of food, but it would suffocate. It is essential those tiny pores are left through the thickness of the shell to allow diffusion of gases. Not only that, but there has to be an egg tooth clipped on to the end of the beak, needed *only* for hatching, otherwise the embryo will reach full term, but perish inside the unyielding shell, unable to escape. The probabilities of all these systems arriving at perfection together is unbelievably tiny. Common sense tells us this sort of combination never arrives in the real world.

It is much simpler to accept the statement in Genesis chapter one that

> *"God created the great sea creatures and every living creature that moves, with which the waters swarm, according to their kinds, and every winged bird according to its kind. And God saw that it was good. And God blessed them, saying, "Be fruitful and multiply and fill the waters in the seas, and let birds multiply on the earth" (Genesis 1:21,22).*

GOD THE CREATOR SPEAKS TO US IN THE BIBLE

You may well still be sceptical. You have been brought up to believe that life evolved, and the idea of a supreme Being out there who put it all together with the help of His angels sounds too miraculous to be true. It is outside your experience. But the formation of life is outside your experience, too. It does not happen, today. There has to be faith, with both approaches. Either you have faith that after millions of years and random combinations of atoms the genetic code arrived on the scene, and from that beginning, by time and natural selection, all the animals and plants grew out in different directions. Or you have faith that God the Creator thought it all through.

If a Creator God *did* make all things in the beginning, there must have been some purpose in His mind. He would, surely, communicate with the intelligent beings He built in to the top of the ecological pyramid. For the Christian believer, the answer is "Of course!" The Bible, the oldest book in the world, is the written record of His communications with men. Here we have a description, a very brief one, of the acts of creation, and then the story of God's dealings with

individual men who lived long ago, but put their trust in Him. It speaks of Abraham, to whom God promised a land, a people and a blessing. It records the life of David the shepherd king, to whom God promised a descendant who would rule for ever. It runs on through the millennia to the New Testament, where we meet Jesus, the son of God, here on earth where he could be seen and touched, and who came to show us what God is like. It finishes with the promise of a Kingdom that will fill the world, where strife and famine and financial crises will be gone forever, and Jesus will return to reign on the throne of his forefather David, and bring blessing to all nations of the earth. That same all-intelligent, supremely wise God is still there. He is waiting to take you on as his son or daughter, and walk through life with you. He is a God of love, who will teach you how to live without fear of the future, and with a purpose, bringing hope and joy to those who know you. And at the end, beyond death, he offers the prospect of living in that Kingdom age along with his son, and those who through the ages have had faith to believe in him. Why not try reading the Bible for yourself? Send for a Bible reading plan, and set aside a quarter of an hour each day to find out about the God who made all things in the beginning.

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