

Chapter 1 : Timeline of the evolutionary history of life - Wikipedia

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Screen resolution x pixels or greater. Internet Explorer 5 and above or Netscape 6 and above. The Evolution of Life Plant and Animal Evolution Fossils Geological Time Sometimes science deals with incredibly large numbers, sometimes with great distances still other times with infinitely small particles. In science we must expand our conception of reality all the time. One of the very difficult concepts is the understanding of time. Everyone is conscious of the changes in the physical and biological world; they give us an awareness of time. The daily rhythm, the seasons, physical changes throughout a human lifetime are familiar concepts of time to us. Time is measured by change, but where change occurs over millions of years our own perception of time is on unfamiliar territory. To understand the rhythm of change of our planet and the effects it has on life on Earth we have to expand our perception of time. The geological processes that shape the surface of our planet, move the tectonic plates, build mountains and erode them again work over millions of years. These forces provide the ever changing conditions for life, which adapted to those changes. But those changes did not go undetected. Earth itself acts like a clock, rotating on its axis once every 24 hours. To identify changes that occurred due to the geological processes of our planet we can look at rocks. They are key to both the past and the nature of processes. Life has managed to leave records of time and the changes it went through time as well. Fossils are the remains of ancient organisms. Some looked very similar to life forms that are still living today. Fossils can be bones, teeth, shells, impressions of plants and even imprints of animal tracks. Fossils within a rock are a type of organic clock that tick by systematic radioactive decay of certain chemical elements, which permit us to measure with remarkable accuracy the number of years that have passed since the minerals in a rock crystallized. Fossils are recorded in rocks much like your footprints are recorded on a beach. As you walk along the beach, if the sand is fine enough and soft enough, you will make footprints. If the wind and waves do not destroy your footprints, they may record your existence well after your passing. Against the odds, these records of past life are preserved.

Chapter 2 : BBC - Earth - The secret of how life on Earth began

Jenkins provides an excellent overview of evolution and the development of life on earth, complete with his always awesome cut paper collage illustrations. He includes information on the beginning of life on earth, the various animals that appeared over the past billion years, the theory of evolution (including how Darwin and others developed it), and variation and mutation.

Browse the full list. How did life begin? There can hardly be a bigger question. For much of human history, almost everyone believed some version of "the gods did it". Any other explanation was inconceivable. That is no longer true. Over the last century, a few scientists have tried to figure out how the first life might have sprung up. They have even tried to recreate this Genesis moment in their labs: So far nobody has managed it, but we have come a long way. Today, many of the scientists studying the origin of life are confident that they are on the right track – and they have the experiments to back up their confidence. This is the story of our quest to discover our ultimate origin. It is a story of obsession, struggle and brilliant creativity, which encompasses some of the greatest discoveries of modern science. Some of the scientists involved have been bedevilled as monsters, while others had to do their work under the heel of brutal totalitarian governments. This is the story of the birth of life on Earth. View image of Dinosaurs actually lived quite recently Credit: The dinosaurs are perhaps the most famous extinct creatures, and they had their beginnings million years ago. But life dates back much further. The oldest known fossils are around 3.5 billion years old. But the fossil record may stretch back still further. For instance, in August researchers found what appear to be fossilised microbes dating back 3.5 billion years. View image of These wavey patterns could be 3.5 billion years old. Nutman et al, Nature The Earth itself is not much older, having formed 4.5 billion years ago. If we assume that life formed on Earth – which seems reasonable, given that we have not yet found it anywhere else – then it must have done so in the billion years between Earth coming into being and the preservation of the oldest known fossils. As well as narrowing down when life began, we can make an educated guess at what it was. View image of The tree of life Credit: Hug, Banfield et al, Nature Microbiology Since the 19th Century, biologists have known that all living things are made of "cells": Cells were first discovered in the 17th Century, when the first modern microscopes were invented, but it took well over a century for anyone to realise that they were the basis of all life. Using only the materials and conditions found on the Earth over 3.5 billion years. So are plants and fungi. But by far the most numerous forms of life are microorganisms, each of which is made up of just one cell. Bacteria are the most famous group, and they are found everywhere on Earth. In April, scientists presented an updated version of the "tree of life": Almost all of the branches are bacteria. In other words, every living thing – including you – is ultimately descended from a bacterium. This means we can define the problem of the origin of life more precisely. Well, how hard can it be? View image of A complete living cell Credit: Equinox Graphics Ltd Chapter 1. The first experiments For most of history, it was not really considered necessary to ask how life began, because the answer seemed obvious. Before the 1800s, most people believed in "vitalism". This is the intuitive idea that living things were endowed with a special, magical property that made them different from inanimate objects. The chemicals of life can all be made from simpler chemicals that have nothing to do with life Vitalism was often bound up with cherished religious beliefs. The Bible says that God used "the breath of life" to animate the first humans, and the immortal soul is a form of vitalism. There is just one problem. Vitalism is plain wrong. By the early 1800s, scientists had discovered several substances that seemed to be unique to life. One such chemical was urea, which is found in urine and was isolated in 1828. This was still, just, compatible with vitalism. Only living things seemed to be able to make these chemicals, so perhaps they were infused with life energy and that was what made them special. Others followed in his footsteps, and it was soon clear that the chemicals of life can all be made from simpler chemicals that have nothing to do with life. But people found it profoundly hard to let go of the idea. For many, saying that there is nothing "special" about the chemicals of life seemed to rob life of its magic, to reduce us to mere machines. It also, of course, contradicted the Bible. As late as 1845, the English biochemist Benjamin Moore was fervently pushing a theory of "biotic energy", which was essentially vitalism under a different name. The idea had a strong emotional hold. Today the idea clings on in unexpected

places. Think of the "regeneration energy" used by the Time Lords in Doctor Who, which can even be topped up if it runs low. This feels futuristic, but it is a deeply old-fashioned idea. Still, after scientists had legitimate reasons to look for a deity-free explanation for how the first life formed. But they did not. Perhaps everyone was still too emotionally attached to vitalism to take the next step. Instead, the big biological breakthrough of the 19th Century was the theory of evolution, as developed by Charles Darwin and others. Instead of each of the different species being created individually by God, they were all descended from a primordial organism that lived millions of years ago: This idea proved immensely controversial, again because it contradicted the Bible. Darwin and his ideas came under ferocious attack, particularly from outraged Christians. The theory of evolution said nothing about how that first organism came into being. View image of Darwin wondered if life began in a "warm little pond" Credit: His excitable language reveals that he knew the deep significance of the question: Some of those compounds might combine to form a life-like substance such as a protein, which could then start evolving and becoming more complex. It was a sketchy idea. But it would become the basis of the first hypothesis for how life began. This idea emerged from an unexpected place. You might think that this daring piece of free thinking would have been developed in a democratic country with a tradition of free speech: But in fact the first hypothesis for the origin of life was invented in a savagely totalitarian country, where free thinking was stamped out: Oparin imagined what Earth was like when it was newly formed Most famously, Stalin effectively banned scientists from studying conventional genetics. Instead he imposed the ideas of a farm worker named Trofim Lysenko, which he thought were more in line with Communist ideology. It was in this repressive environment that Alexander Oparin carried out his research into biochemistry. He was able to keep working because he was a loyal Communist: In 1924, Oparin published his book *The Origin of Life*. View image of Oceans formed once Earth had cooled down Credit: The surface was searingly hot, as rocks from space plunged down onto it and impacted. It was a mess of semi-molten rocks, containing a huge range of chemicals "including many based on carbon. If you watch coacervates under a microscope, they behave unnervingly like living cells Eventually the Earth cooled enough for water vapour to condense into liquid water, and the first rain fell. Before long Earth had oceans, which were hot and rich in carbon-based chemicals. Now two things could happen. First, the various chemicals could react with each other to form lots of new compounds, some of which would be more complex. Second, some of the chemicals began to form microscopic structures. Many organic chemicals do not dissolve in water: But when some of these chemicals contact water they form spherical globules called "coacervates", which can be up to 0. If you watch coacervates under a microscope, they behave unnervingly like living cells. They grow and change shape, and sometimes divide into two. They can also take in chemicals from the surrounding water, so life-like chemicals can become concentrated inside them. Oparin proposed that coacervates were the ancestors of modern cells. The idea that living organisms formed by purely chemical means, without a god or even a "life force", was radical Five years later in 1929, the English biologist J. Haldane independently proposed some very similar ideas in a short article published in the *Rationalist Annual*. He was also a larger-than-life character. On one occasion, he suffered a perforated eardrum thanks to some experiments with decompression chambers, but later wrote that: This set the stage for "the first living or half-living things" to form, and for each one to become enclosed in "an oily film". View image of The English geneticist J.

Chapter 3 : Life on Earth: The Story of Evolution by Steve Jenkins

Biology: Life on Earth with Physiology, 10/e - Ebook pdf Life on Earth is a wonderful introduction to biology, it goes through our entire evolution in a coherent way.

Darwin and Wallace rewrite the theory of evolution Darwin and Wallace presented their accounts of evolution at the same meeting Darwin finally went public with his groundbreaking theory of evolution by natural selection, while making sure that Wallace received some credit. Wallace, on his return, accepted that Darwin had treated him fairly. But Darwin missed the presentation. A private tragedy struck: I am quite prostrated, and can do nothing I hardly care about it. It would become one of the most important books ever written. He dreaded losing his reputation, as his grandfather Erasmus had. Charles did draw fierce criticism from the Church, and from some parts of the press. However, some were now willing to listen to evidence for evolution especially from a leading figure like Darwin. One general law, leading to the advancement of all organic beings, namely, multiply, vary, let the strongest live and the weakest die. Andrew Marr re-enacts key moments from the Oxford Debate. It was left to others notably a young biologist named Thomas Huxley to take up the fight. In the 19th Century, scientific talks were popular entertainment and any debate about evolution was sure to draw crowds. In what many saw as a key battle between science and God, Huxley went head to head with Bishop Samuel Wilberforce and his Biblical account of creation. Both sides claimed victory. The debate has become part of the Darwin legend and shows how his ideas shook Victorian society. A witness recalls the Oxford University debate A worrying inheritance Charles Darwin and his son William, taken in Darwin wrote a warning about close relatives having children, buried in an obscure botanical textbook. He was already worried about his own marriage. Darwin and his cousin Emma had ten children and Charles was a devoted father. Yet the couple had now lost a son and two daughters, and nursed others through illness. Darwin knew that orchids were less healthy when they self-fertilised and worried that inbreeding within his own family may have caused problems. Yet when Darwin lobbied to add questions on cousin-marriage to the census he was refused. Queen Victoria had married her cousin, and Darwin was challenging another taboo. Nature thus tells us, in the most emphatic manner, that she abhors perpetual self-fertilisation. Each has adapted to its environment. Origin of Species was a bestseller worldwide and went into multiple editions. With each new edition, Darwin strengthened his arguments. By responding to critics, he was able to build a more robust case. The book was another challenge to Christian orthodoxy. Yet in the decade since Darwin had gone public, his ideas had gained acceptance. I have little strength and feel very old. Darwin describes his final book: He died a virtual recluse, surrounded by his wife and a few devoted friends. In his final months Darwin was tended by Emma, who had stood by him despite their differences in religious belief. Yet his followers, including the indomitable Huxley, had grander plans. He was buried at Westminster Abbey. A man who dares to waste one hour of time has not discovered the value of life.

Chapter 4 : Earth's History and Evolution

LibraryThing Review User Review - enbrown - LibraryThing. Life On Earth is a cool entry level book that introduces the concepts related to evolution and the life and accomplishments of Charles Darwin.

Chapter 5 : Evolution: The Story of Life on Earth by Jay Hosler

The graphic novel Evolution: The Story of Life on Earth takes the typical tale of evolution and adds an intergalactic narrative that makes science fun and understandable. Bloor, an alien scientist, has been summoned by King Floorish to explain the theory of evolution.

Chapter 6 : Life on Earth: The Story of Evolution - Steve Jenkins - Google Books

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Chapter 7 : BBC - iWonder - Charles Darwin: Evolution and the story of our species

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Chapter 8 : Evolutionary history of life - Wikipedia

*Evolution features the same characters introduced in the highly regarded *The Stuff of Life: A Graphic Guide to Genetics and DNA*, now here to explain the fundamentals of the evolution of life on earth.*

Chapter 9 : How geology tells the story of evolutionary bottlenecks and life on Earth

There is a million year gap in Earth's history, and in that time one of the most transformative events happened: life appeared. This missing epoch could hold not just the secret of humanity's.