THE DEEPS OF TIME. pdf

1: Timeline of the Deepwater Horizon oil spill - Wikipedia

"And amid all the splendours of the World, its vast halls and spaces, and its wheeling fires, IlÃºvatar chose a place for their habitations in the Deeps of Time and in the midst of the innumerable stars.".

He rounded Cape Horn in January , entering the vast, unexplored Pacific and Southern Oceans and opening up an entirely new vista on the world. He discovered new Pacific islands and Australia. He found never-seen-before animal species and more than 1, exotic species of plants. The observations he made there of animal life spurred his theory of natural selection, which revolutionized our understanding of the origin and evolution of species. Centuries after these classical voyages, we are making discoveries that are similarly shaking and expanding prevailing ideas about life on our planet. Once again we have embarked on voyages to explore remote, unknown areas of our planetâ€"this time in, rather than on, the oceans. Wherever we have looked in the oceans, we have found previously unknown microorganisms. We have often found them living in conditions once thought to be incompatible with life, using unfamiliar physiologic and metabolic adaptations. These discoveries have radically changed our thinking about where and how life may have originated and evolved on this planet, and where it might exist on others. The seafloor and the rocky regions below it offer boundless new potential habitats to explore. With research submersibles, robotic vehicles, and new sampling tools and techniques, marine microbiologists are making discoveries at an unprecedented rate. We are opening a wide window onto the immense, unexplored realm of the smallest, least-known, but most important life forms. We have entered the classical age of microbiology. Recent discoveries Without microorganisms, there would be no other life on Earth. Unseen, ubiquitous, and unicellular, microorganisms nevertheless keep the planet running. Photosynthesizing plankton form the base of the marine food chain and keep the biosphere well oxygenated. At the other end of the cycle, other microbes decompose organic molecules for reuse. It was not until that we discovered cyanobacteria in the open ocean, which turn out to be among the most abundant and important bacteria on Earth. Then in , Carl Woese of the University of Illinois identified a wholly new domain of single-celled life forms, called archaea, which are as genetically different from bacteria as bacteria are from trees and people. Many are extremophiles that thrive in hot, cold, salty, acidic, oxygen-deprived, or other extreme environments. Life in unexpected places In the late s, we also discovered microbial communities in the dark and high-pressure depths of the seafloorâ€"living on superheated, acidic, sulfide-rich fluids emanating from hydrothermal vents. Since then, we have found microbes that thrive in polar ice; on ocean floor lava; buried beneath seafloor sediments; and in the rocky nooks beneath the seafloor. They exploit a wide range of chemical reactions, using hydrogen sulfide, iron compounds, nitrites, methane, and other chemical compounds to obtain energy and resources to grow. This great variety of habitats and metabolic strategies indicates that microbes have taken a diversity of evolutionary pathways in the past. Ancient microbial lineages, which had their origin and possible heyday when different biogeochemical conditions prevailed on Earth, can survive today in diverse habitats that still exist in the mostly unknown deep subsurface of oceans. The novel microbial lineages we are finding on Earth are also expanding and guiding our search for life that may exist in the extreme environments on other planetary bodies. With our eyes opened wider to more possibilities, we can look for life in previously unsuspected places: To study microbes, scientists need to keep them alive, but it is often hard to reproduce undersea conditions in the laboratory, and only some microbial species have been successfully cultured. Instead, microbiologists have exploited modern genetic techniques to search for, identify, and study newly found microbes. They examine samples from deep-sea environments containing unknown species of microbes, locate gene sequences within them, and compare these sequences with those of known, cultured microbial species. An unknown organism in the wild can be identifiedâ€"on the basis of how similar gene sequences are to those of known microbesâ€"without scientists ever having to grow it in the laboratory. Fully half of the bacterial branches known today have never been cultured and have been identified only by gene sequences. Mutations that change gene sequences accumulate in genes over evolutionary time, but this process occurs at a far slower rate in conserved genes than in other genes. Thus, conserved genes are similar in closely related organisms and less similar in distantly related ones. The greater the differences in conserved genes shared by two organisms, the further back in time they diverged in evolutionary history. By analyzing the DNA of conserved genes, scientists can place microorganisms in evolutionary trees that encompass deep evolutionary time and chronicle when various microbial biochemical and metabolic machinery developed and diverged. Surveying samples from marine environments, microbiologists are finding novel gene sequences from unknown organisms and accumulating libraries of gene sequences to reference newer discoveries. Little microbes that could At the same time, microbiologists are also extracting nucleic acids from microbes to determine what protein products the nucleic acids code for. By these means, we can find out something about what compounds and biochemical mechanisms the microorganisms use to obtain energy and carbon to live and grow. In addition, microbiologists are analyzing isotopes of elements incorporated into microbes during their metabolic processes. In , for example, we found new species of microbes that live directly off minerals in seafloor rock. They oxidize iron in the rocks to obtain energy and convert carbon dioxide in seawater into organic matter to grow. They may have changed the geology of the seafloor by changing the chemical composition of seafloor rocks. They may have been evolutionary pioneers on an iron-rich, oxygen-poor early Earth, or inhabitants of iron-rich, oxygen-poor planets today, such as Mars. No oxygen, no problem Over the past few years, for example, we have sampled and analyzed sediments in the Guaymas Basin in the Gulf of California, where hundreds of meters of sediments have piled on top of hydrothermal vents. We had expected to find the molecular signs of archaea adapted to high heat hyperthermophiles , which are well known at hydrothermal vents. But instead we found something completely differentâ€”a major new type of archaea, related to known methane-producing archaea, or methanogens. We believe that the high geothermal heat emanating from the hydrothermal vent site is breaking down organic matter in the sediments into short-chain fatty acids, ammonia, and more methane. Some of these compounds percolate upward and are released from the sediments into the oceanâ€”but not all of them. In the sediments we also found isotopic and gene sequence signatures that reveal archaeal populations that use methane to grow in oxygen-free environments, such as those beneath the Guaymas sediments. Microbes that generate methane, and others that consume it, play crucial roles in minimizing how much methaneâ€”a greenhouse gas more potent than carbon dioxideâ€”is released from the ocean to the atmosphere. These microorganisms complete a subsurface methane cycle that allows life to flourish at the seafloor, not only in the microbial oases of hydrothermal vent sites, but also in deep marine sediments and the subsurface biosphere. We are now exploring deep marine sediments in the Pacific to investigate whether this phenomenon is global. The book on microbial life, on Earth and elsewhere in the universe, is far from written. The discovery of a great variety of deep-sea microorganisms using diverse metabolic strategies to live in diverse habitats indicates that they evolved along different evolutionary pathways. Using genetic analyses, scientists can trace these pathways to reconstruct when various microbial biochemical and metabolic machinery developed, diverged, or intermingled in the three major domains of life: Yellow bacterial mats atop sediments in the Guaymas Basin in the Sea of California top are evidence of microbes that oxidize sulfide; the sediments underneath harbor methane-oxidizing archaea. The orange mats above are made by microbes that live off iron in seafloor rocks off Hawaii.

2: Deep Time Project â€“ Hunter Living Histories

Tags: , Edison - Lathrop, George Parsons Lathrop, Helium Balloon, In the Deep of Time, Robot, Simon Yates, Thomas A. Edison, Walking machine Posted in Walking Machines â€¢ Comments Off on - Lathrop & Edison Walking Machine - (American).

While traveling on the Nile Delta, he realized that the sediments had accumulated from river floods and that thousands of years had been required to form the visible part of the delta deposits. However, the contrast between human history and geologic history did not really become fully articulated for more than two millennia. Those older rocks had to have been lithified from unconsolidated horizontal sediments before being deformed to their present attitude and eroded to form an ancient land surface beneath the sandstones. Here was indisputable evidence that Earth had a history that far pre-dated human history. Thus the time context for humanity was clearly established and has been reinforced by all subsequent geologic work. By recognizing the vastness of Earth history compared to human history, we internalize what John McPhee has termed Deep Time and we gain an essential perspective from which to consider the results and consequences of our human impacts on Earth. Preserved human artifacts and written records show clearly that we modern humans have essentially experienced only the present landscape. Even if it has been locally modified by geologic processes, the painted caves of the Pyrenees remain as caves and some ancient city ruins of Mesopotamia and tombs of pre-dynastic Egypt remain standing on flood plains. The clear archaeological evidences for recency of the advent of modern Homo sapiens, dramatize the awesome changes have been wrought on our planet by humans in the recent historical past. Satellite images document how much urban sprawl in the U. Geologists have no problem with the concept of Deep Time, but it is clearly a concept that is not widespread at a very high level of consciousness in the general public. Raising the level of public awareness of this concept is our challenge and our responsibility. Several other ways to try to get the key idea of Deep Time into the public domain are suggested in the following demonstrations. This approach can be used in many areas by creative teachers to make the point of the antiquity of Earth compared to human history. Almost any rocks in your area can serve this purpose. A good way to begin is to look for common, ordinary processes that affect the rock. If there is a gravel pit, the sizes of the cobbles in the gravel provide an opportunity to discuss the rate of accumulation of gravel that contains cobbles of that size, the kind of current needed to transport those cobbles, the likelihood of such discharge, and the time it would take to accumulate a gravel bed of given thickness. If a rock outcrop is covered by lichen, some simple library research could determine the identity of the lichen, how fast it grows in the region, and what the size of the colony implies about the age of that particular rock exposure. Perhaps this is enough. In a non-technical approach, we can explain that in rocks that cooled from a molten state like granite, which cooled slowly some distance underground and thus has large mineral grains, or basalt, which cooled relatively rapidly from a lava flow and thus has much smaller mineral grains , some of the crystallized minerals contain radioactive atoms of an element that decays at a known rate to produce a recognizable decay product daughter which is another element. Once that mineral has crystallized, it becomes a closed box, and the radioactive atoms and their daughters will both remain within the box. Although some leakage is possible, there are ways to detect such leakages and make corrections for them. Very sophisticated chemical analyses can detect the amount of the radioactive element and its decay product in the mineral grain box. The longer the mineral has been a closed box, the more daughter element there is relative to the parent. Because we know the rate of decay of the parent, we can tell from the proportions of the daughter element vs. Even so, if we can identify minerals that have formed subsequent to the deposition of the rock, we still have a way to measure the minimum age of the rock itself. If the rock is organically precipitated and is relatively young, like a coral reef, the decay of radioactive uranium, incorporated from sea water into the skeleton by the coral polyps, into its daughter product, lead, allows the age of the reef to be determined. If students have grasped the idea of metamorphic rocks, then it can be explained that numbers from minerals in those rocks most commonly date the time when those mineral grains were recrystallized during metamorphism and became closed boxes. This time will be much younger than the age of the original rock before it was metamorphosed. Again, a non-technical explanation may suffice to make the point. Every living organism, plant or animal, is constantly processing carbon dioxide through its system. Some of the carbon in the carbon dioxide is the product of interactions between cosmic rays and nitrogen high in the atmosphere that produce an unstable form of carbon we call carbon This unstable form will gradually decay back to nitrogen, but more is being created all the time at about the same rate as the earlier carbon atoms decay. The unstable form is thoroughly mixed with the more common and stable form of carbon â€" carbon â€" so that the ratio of carbon to carbon is essentially constant in the carbon dioxide of the atmosphere and the carbon dioxide dissolved in an ocean or in bodies of fresh water. When an organism dies, it stops adding carbon. Over time, the part of the carbon in the organism that was carbon decays until all that remains is carbon Thus, the longer the organism has been dead, the smaller the proportion of carbon that can be detected, again by tricky chemical analysis, in the remains. With increasingly sophisticated technology, we can now determine when an organism died by using carbon-bearing remains usually bone, shell or wood that are as old as 70, years. For materials that have been dead longer than that, there is too little remaining carbon to detect. While 70, years sounds like a long time to most of us, it is only a fraction of the millions to billions of years that can be estimated from analysis of minerals found in most granites or similar rocks. Thus, dating of materials using the carbon technique is primarily of value in archaeological studies â€" that is, dates of happenings well within the geological history of human beings. If the age of the Earth 4. Enlarge that one millimeter as a horizontal axis marked off in tenths 4, years on the lower part of the page and show the locations of the beginning of the last de-glaciation 13, years , the beginning of the agricultural revolution 10, years , and other historical events such as the pyramids 5, years â€" this is usually enough to get the scale across. For continuing discussion below also show the proportion of that time line that represent the last years. A downloadable image of this figure is provided on the webpage Visualizing Deep Time. How many other ways can you or your students devise to communicate the concept of deep time? When discussing deep time with adult audiences, you might bring in this beautiful quote: If you use the quote, it might also be appropriate to distinguish between deep time something finite, measurable and testable and eternity a philosophical concept. To further emphasize the impact of humans on earth, construct a vertical axis at the present-day end of the one-millimeter time-line, scale off seven tick marks at one-inch intervals representing global human population in billions, and draw a population growth curve for the past years, noting that population prior to that time was probably less than 1 billion, but it was about 1. On the scale of the time-line, this is essentially a vertical line. Cover this part of the diagram on the overhead transparency until the point about the time scale has been made. Then reveal the population curve, note its resemblance to a rocket, and point out that this curve shows not only population growth, but also growth in consumption and in production of wastes.

3: In the Deep of Time Archives - www.enganchecubano.com

Deep time is the concept of geologic www.enganchecubano.com modern philosophical concept was developed in the 18th century by Scottish geologist James Hutton (). The age of the Earth has been determined to be, after a long and complex history of developments, around billion years.

The sedimentary principles are: In order from youngest to oldest, the sequence is as follows: Portrait of a Planet by Stephen Marshak Students can relate to the making of a peanut butter and jelly sandwich - this is a great way to help students understand the sedimentary principles listed above: Fish fossil, penny for scale. Details These principles allowed geologists to create relative timescales for areas. But how can we begin to put together a history for the whole Earth? Details The occurrence of special fossils called index fossils that only occur in rocks from specific times throughout the world and the fact that fossils occur in a very specific succession allowed geologists to correlate rock units across vast distances. This allowed geologists to construct a global relative geologic column. Each section of the geologic column was given a name corresponding to localities with complete geologic sections or to characteristics of the period. Boundaries represent significant changes in diversity of life on the planet. The geologic timescale Bertram Boltwood. Details With the discovery of radioactivity, geologists like Bertram Boltwood at right could use minerals in rocks to discover the age of crystallization. Many began work to put numbers on the geologic time scale. Ironically, most fossils cannot be dated using methods that involve radioactive decay. However, the occurrence of pyroclastic volcanic deposits interbedded with and igneous rocks that cross cut sedimentary rocks allows us to bracket the ages of rocks that contain important fossils. The numerical geologic time scale is in a constant state of flux as geochronologists geologists who date rocks find or bracket more precise ages for the fossiliferous rocks used to construct the original geologic column. The discovery of radioactivity allowed us to put a scale on the geologic column. How do geologists know Earth is that old? Uniformitarianism - the present is the key to the past Charles Darwin. Details Even before the discovery of radioactivity, James Hutton, Charles Lyell and Charles Darwin were making observations about physical processes acting on rocks and biota. They suggested that in order for processes like evolution and deposition of kilometers of sediment required vast amounts of time; therefore, Earth must be significantly older than human history. Using sedimentation rates and heat flow estimates many scientists attempted to calculate the age of Earth. Observations of erosion and depositional rates today are slow enough to indicate that a vast amount of time is required to deposit and erode, say, the sedimentary rocks of the Grand Canyon in Arizona. Because there is little physical evidence that physical processes in the past were acting at significantly faster rates, we can conclude that the Earth must have been around for a significant amount of time. Even though these scientists made important observations about the processes acting on the earth, their estimates for the age of the Earth were off by orders of magnitude. Even in the late 19th century, plate tectonics and radioactivity had not been discovered. Hutton and Lyell had to rely only on visual observations of rocks that formed on the continents. Moon rocks and Meteorites The discovery of radioactivity furthered the study of geologic time tremendously. However, because of plate tectonics and erosion, geological materials materials are continually being recycled through the Earth system. Geologists have found no rocks in tact that are older than about 4 billion years old. Students have difficulty understanding that we must use other pieces of evidence to understand the age of the Earth. The oldest rocks that have been dated on Earth are merely 4. How, then, do we know that the Earth is 4. There are a number of pieces of evidence: Some grains of sand in Australia have been dated at 4. Imagine collecting hundreds of meteorites and having almost all of them give the same ages! How likely is that? Because almost all meteorites have the same age, and are similar in composition to Earth, it is likely they formed during solar system accretion along with the Earth, Moon and other planets in our solar system. Thus, the ages of these things suggest that the Earth formed approximately 4,,, years ago. Until we find evidence to suggest otherwise, this is the accepted age of the Earth. Science and religion happy? Concepts of deep time challenge the belief that the Earth was created in 7 days by a Higher Being. Increasingly, the idea that vast amounts of time are needed for geologic processes are challenged by creationists. Reconciling beliefs with scientific evidence and inquiry can be challenging for these students. Examples and Exercises Toilet Paper Geologic timescale Geologic timescale with sheet roll of toilet paper contains teaching notes for using this as a demonstration in class, a modifiable table and possible assessment techniques. Also included are links to other pages with information about using this activity in class. Calculator tape timescale Geologic timescale using a pre-measured length of calculator tape contains teaching notes for using this as an activity for small groups. Earth History approach to teaching geoscience SERC at Carleton College has an excellent site on teaching entry-level geoscience with an Earth history approach. Included in these pages, there are links to teaching about the geologic timeline with resources about the timeline. There are also links to teaching about evolution.

4: The Deeps of Time

The Silmarillion Symphony Ep The Deeps of Time by Aaron Dunn, released 21 March 1. The Music of the Ainur 2. Beginning of Days 3. Bliss of Valinor 4. The Great Flight 5.

The plan stated that it was "unlikely that an accidental surface or subsurface oil spill would occur from the proposed activities". Hafle, a senior drilling engineer at BP, warns that the metal casing for the blowout preventer might collapse under high pressure. March â€" An accident damages a gasket on the blowout preventer on the rig. Gagliano says they should use April 17 â€" Deepwater Horizon completes its drilling and the well is being prepared to be cemented so that another rig will retrieve the oil. The blowout preventer is tested and found to be "functional. It is required in rules. Crew leaves on Before she could make sense of it â€" a rig shaking shock that came out of nowhere â€" magenta warnings began flashing on her screen. Magenta meant the most dangerous level of combustible gas intrusion. Most of the current pollution has been mitigated by the fire. There is some surface sheening extending up to 2 miles from the source. The crews report "large amounts of oil that flowed out. Mary Landry tells CBS "At this time, there is no crude emanating from that wellhead at the ocean surface, er, at the ocean floor There is not oil emanating from the riser either. First, weather and sea-state did not allow continuous skimming and alternatives were needed. Second, skimmers and dispersants could not completely remove the oil being released from the well. Finally, the OSC determined in situ burning ISB was a safe and effective way to remove large volumes of oil from the ocean surface, based on data for in situ burns from previous spills. BP reports a leak 1, barrels 42, US gallons; cubic metres a day. BP begins process to establish two relief wells. Booms set up to keep oil from washing ashore. Repairs are being worked overnight. April 28, the National Oceanic and Atmospheric Administration estimated that the leak was likely 5, barrels , US gallons; cubic metres a day, five times larger than initially estimated by BP. President Barack Obama halts new offshore drilling unless safeguards are in place. Oil discovered in the South Pass. May 10 â€" After failed containment dome BP announces plans to apply five feet in diameter containment vessel nicknamed "top hat". The strategy is nicknamed "junk shot. It is initially dislodged when an underwater robot collides with the pipe. May 17 â€" BP begins burning off gas with the Discoverer Enterprise. Supporting his position is Steve Wereley from Purdue University who says the leak may be 70, barrels 2,, US gallons; 11,, litres a day. May 19 â€" Oil washes ashore on mainland Louisiana. BP says that if oil reaches the shore, it would do more environmental harm than if it were dispersed off the coast. It notes that Corexit is the only product that is available in sufficient quantities to deal with the spill. It also flatly denies it ever considered using a nuclear bomb on the well as some suggested. Coast Guard and Minerals Management Service hearing that a BP representative overruled Transocean employees and insisted on displacing protective drilling mud with seawater just hours before the explosion.

5: Deep time - Wikipedia

The Deep Stories of Our Time One of the voices many have been turning to in recent years is Arlie Hochschild. She helped create the field of the sociology of emotion â€” our stories as "felt" rather than merely factual.

References Life on the planet started astonishingly early. The first living organisms, in the current model of evolution, are thought to be Prokaryotes1. The oldest known fossilised prokaryotes have been dated to approximately 3. Eukaryotes2 are more advanced organisms with complex cell structures, each of which contains a nucleus. Although incredibly hard to determine their origin, they are thought to have developed 1. Animals4, in the most basic sense of the word, are considered to have evolved from Eukaryotes. Fossils of early sponges have been discovered in million year old rock. Later on, around million years ago, some highly significant fossils of an organism which was named Charnia4. These enigmatic early animals were anchored to the sea floor where they are thought to have absorbed nutrients. Around million years ago, during the Ordovician Period, land plants appeared, although new evidence may suggest that complex photosynthetic plants developed over million years ago. Studies of fossils from the Devonian Period â€" Ma5. Towards the end of this time seeds had evolved. The dominance of the Dinosaurs6 lasted for over million years, from around Ma, to their ultimate demise at the end of the Cretaceous 65 million years ago. The extinction of most dinosaur species occurred during the Cretaceousâ€"Tertiary extinction event6. The fossil record indicates that birds evolved within theropod dinosaurs during the Jurassic period. Some of them survived the Cretaceousâ€"Tertiary extinction event, including the ancestors of all modern birds. The first Mammals7 are our most direct ancestors, they evolved from Amniotes7. All mammals posses the same characteristics; they are warm-blooded vertebrate animals of a class that is distinguished by the possession of hair or fur, the secretion of milk by females, and typically the birth of live young. One of the earliest known mammals was Eozostrodon7. The genus Homo gave rise to modern humans8, Homo sapiens, us. It is estimated we have been around for 2. Incredibly, recent evidence from Ethiopia8 places the earliest signs of stone tool usage at before 3. Modern humans have evolved into highly intelligent beings who posses the power, and desire, to understand who we are, where we came from, and how the natural world works. We have even become ambitious enough to try and help each other to understand these amazing things through ever more advancing visual communication! Back to the clock The Hadean Eon9 is named after the god Hades, which is Greek for Underworld, and generally refers to the chaotic conditions on the early Earth. This was a time on Earth before there were any rocks, making geological study of this eon very difficult. The oldest dated material from this time were crystals formed from zircon. Fossils of stromatolites, which were instrumental in creating the free oxygen in the atmosphere are found throughout the Archean, becoming especially common late in the eon. The Proterozoic Eon11 is the largest classified time period extending 2 billion years. The name Proterozoic is Greek for earlier life. We have a much better geologic record of this time as many of the rocks are less metamorphosed than from the Archaen Eon. The first-known glaciations occurred during the Proterozoic, one began shortly after the beginning of the eon, while there were at least four during the Neoproterozoic, climaxing with the Snowball Earth of the Varangian glaciation. The current Eon in the geologic timescale is the Phanerozoic covering roughly the last million years. Here, this infographic splits into 3 Eras, the first of which is the Paleozoic Era Towards the end of the era, around million years ago, sophisticated reptiles and the first modern plants had developed. The Mesozoic Era13 is the second period during the Phanerozoic Eon and extended from â€"65 million years ago. This was the Age of Dinosuars6 but also a time of intense tectonic, climatic, and evolutionary activity. The gradual drift of the continents towards their present positions resulted in the end of the supercontinent Pangaea. The climate was exceptionally warm throughout the period; this also played an important role in the evolution and diversification of new animal species. By the end of the era, the basis of modern life was in place. The Cenozoic Era14 is the current and most recent of the three Phanerozoic geological eras and covers the period from It is marked by the Cretaceousâ€"Tertiary extinction event The Cenozoic Era is ongoing. Back to the clock Of the several theories on how the moon was formed15, the prevailing idea today is the Giant Impact Hypothesis It is thought that the Earthâ€"Moon system formed as a result of a giant impact with a body known as Theia, a Mars-sized planet that collided with the nearly formed proto-Earth, blasting material into orbit, which accreted to form the Moon. The large amount of energy released in the giant impact event and the subsequent re-accretion of material in Earth orbit would have melted the outer shell of the Earth, forming a magma ocean. The newly formed Moon would also have had its own lunar magma ocean. The origin of life is still one of the biggest scientific mysteries. All known life forms share fundamental molecular mechanisms, and based on these observations, theories on the origin of life attempt to find a mechanism explaining the formation of a primordial single cell organism from which all life originates The RNA world hypothesis These nucleotides regularly formed bonds with one another, producing chains which are proposed as the first, primitive forms of life and the precursor to DNA, the building blocks of complex life. Photosynthesis17 is the chemical process that converts carbon dioxide into organic compounds, especially sugars, using the energy from sunlight. It is vital for all aerobic life on Earth. The first photosynthetic organisms probably evolved around million years ago, extremely early in the evolutionary history of life, when all forms of life on Earth were microorganisms and the atmosphere had much more carbon dioxide. Cyanobacteria is also known as blue-green algae, blue-green bacteria, and Cyanophyta It is a phylum of bacteria that obtain their energy through photosynthesis. Cyanobacteria appeared, around million years ago, and drastically changed the Earth when they began to oxygenate the atmosphere, beginning about Ma ago. This major environmental change happened around 2. From their perspective it was a catastrophe. Response to such engagement results in the formation of long tracts of highly deformed rock called orogens or orogenic belts. It is the primary mechanism by which mountains are built on continents. The supercontinent Rodinia21 existed between and million years ago, in the Neoproterozoic era. It formed around Ma by accretion and collision of fragments produced by breakup of the older supercontinent, Columbia. Rodinia broke up in the Neoproterozoic and its continental fragments were re-assembled to form another supercontinent, called Pangaea, â€” million years ago. In contrast with Pangaea, little is known yet about the exact configuration and geodynamic history of Rodinia. The sudden multiplication of life forms on Earth, known as the Cambrian explosion Another, much earlier and longer, snowball episode, the Huronian glaciation, which occurred â€” Ma may have been triggered by the oxygen catastrophe.

6: The Deeps of Time in the Depths of the Ocean : Oceanus Magazine

"Deep time" refers to the time scale of geologic events, which is vastly, almost unimaginably greater than the time scale of human lives and human plans. It is one of geology's great gifts to the world's set of important ideas. The concept of cosmology, the study of the origins and eventual fate of.

Pocket A careful reading of Walden; or, Life in the Woods makes it clear that Thoreau never intended his cabin to be a solitary hermitage,â€¦By Curt Stager A careful reading of Walden; or, Life in the Woods makes it clear that Thoreau never intended his cabin to be a solitary hermitage, although fans and detractors alike often misunderstand this. Ice-cutters and woodcutters, anglers and boaters, and even a noisy train were as much a part of his surroundings as the lake, woods, and wildlife. For Emerson, nature represented an embodiment of the divine, an aesthetic ideal that was best described in poetic or quasi-religious abstractions. Contemplating it was a way to transcend normal daily life and seek deeper spiritual lessons. Recognizing that satellites now cruise space and our fossil carbon emissions contaminate the air, rivers, and leaves of the entire planet, author Bill McKibben built a similar concept into the title of his groundbreaking book on global warming, The End of Nature. His journals recorded minute details of the world around him, from the number of growth rings in a tree stump to the gyrations of shiny black whirligig beetles on the surface of the lake. I see no whirligigs here this early in the year, but they are easy to spot on a lake such as Walden when the water is still and they can gather in close, swirling clusters. They overwinter on the bottom and emerge in spring to breed, producing new generations that grow to fingernail length within a few weeks. Each beetle uses flattened legs to paddle quickly through the thin surface film, guided by compound eyes that are each divided, with one-half aimed above the water line and one-half below. Most fish leave whirligigs alone because they leak bitter chemicals when handled, and I have seen newly stocked brook trout, brazen and ignorant from life in the hatchery, snatch whirligigs from below and then spit them back out again like slippery watermelon seeds. Whirligigs often gather in groups that help to discourage predators by pooling more watchful eyes in one place, and the whirling dances within the clusters are not as random as they seem. The individuals on the perimeter are generally searching for fallen gnats, emerging midges, or anything else edible, and they emit ripples like radar to home in on struggling prey. In adult swarms, those closer to the center are more likely to be cruising for mates, using their ripples to communicate with one another and avoid collisions. The journals that he kept from to were so full of natural history observations that they might have become a major scientific work if he had not died of a lung ailment at age He probably thought so, too. In August , he also sent a thermometer down in a stoppered bottle to measure the layered structure of the water column, a first formal analysis of the thermal stratification of the lake. He was amazed at the temperature difference between the upper and lower layers, and he speculated on what it might mean for the resident fish. How much this varied temperature must have to do with the distribution of the fishes in it. He also measured the stratification of the water in more detail, finding temperatures close to 79 degrees Fahrenheit 26 degrees Celsius in the upper 15 feet 5 meters that fell to 41 degrees Fahrenheit 5 degrees Celsisus near the bottom. The Boston University ecologist Richard Primack has compared recent observations of ice-out dates, flowering times, and other signs of spring to the dates that Thoreau recorded in his journals. In Walden Warming, he used those data to show that climate change has shortened the ice-cover season by several weeks since the 19th century. And one journal entry from tripped up another friend of mine, biophysicist Charles McCutchen. While standing beside a local stream in , Charlie had noticed something resembling a fine thread on the surface that undulated crosswise to the current. After careful study, he identified it as an ephemeral wrinkle where the surface film folded inward on itself. Soon after he published his discovery in Science, however, another researcher pointed out that Thoreau had already described the same phenomenon, both accurately and more poetically. I see in one place a sharp and distinct line, as if it were a cobweb on the water When I return to Walden in August, my students Rory and Elliott carry our two canoes to the boat launch and lash them into a makeshift catamaran. The adjacent beach is packed with bathers, and although the water is still clear, a faint greenish tinge warns of potential trouble. Analyses published in by the United States Geological Survey showed that surreptitious urine releases by swimmers had approximately doubled the summer phosphorus budget of the lake. All living things, ourselves included, consume it in food and release it in waste molecules that other organisms may later use. They found that distinctive phosphorus-loving species have dominated the planktonic algal community since the early 20th century. My students and I have come here now to consult the sediments for an update on the status of the lake and to more closely examine its climatic history with an eye toward the future. Hineline Welcome to the Anthropocene. This greeting is belated, of course. We have all been here the whole of our lives, without knowing it for most of our days. The Anthropocene is a span of geological and evolutionary time technically, an A fibrous alga, Nitella, forms a ring of matted meadows on the lake bed at depths between about 20 and 40 feet 6 to 13 meters , but darkness prevents it from colonizing the deeper places farther offshore. Unlike true aquatic plants, its ancestors remained within an entirely different kingdom of life, Protista, that is dominated by single-celled species. The Nitella meadows in Walden Pond divert dissolved phosphorus away from the microscopic algae of the plankton and trap it on the bottom. Like the continuous flush of groundwater, they help to keep the lake clear, but ecologists worry that any further clouding of the water by overfed plankton might shade them out and tip the scales in favor of pond scum. To this fisherman, however, the Nitella seems to be more of a nuisance than a blessing. I ask what he hopes to catch. Rainbow trout are native to the western United States, and brown trout were brought to North America from Germany during the 19th century. A young free-diver approaches and shows me a GoPro video on his cell phone. In the video, his hands follow a guiderope into murky darkness in the foot basin. According to him, the deepest part of the lake is surrounded by steep ledges, and huge snapping turtles lumber around the margins of the pit like dinosaurs. As we paddle out to the center of the lake a bald eagle swoops low overhead, perhaps scanning for trout. After the huge bird flaps back up and over the tree line, my attention aims downward, too. Beneath us lies an extension of the landscape that mirrors the underbelly of the iceberg that formed it. Thoreau identified the foot hole at the west end of the lake and a foot 16 meter basin at the east end near the swimming beach, but he missed a third one midway between them. The USGS scientists found it only a decade ago, measuring depths close to 65 feet 20 meters near the center of it. That is where we are headed now. Rory and Elliott toss two anchors and draw the lines tight while I retrieve a conical net that I have been towing behind us. The mesh is finer than that of a nylon stocking, and it sieves the dilute broth of plankton beneath us. When I hold a glass vial of the catch up to the sky, I see creamy flecks dancing like dust motes in the sunlight. They use their tapered abdomens as rudders and swim by paddling with multiple pairs of jointed limbs while additional limbs also strain the water for microscopic algae. A healthy population of zooplankton animal plankton can filter the entire volume of a lake within days, a testament to the rapid growth of the phytoplankton plantlike plankton they graze on. I tip most of these animals back into the lake and feel sorry for the few I must keep as specimens even though I have already killed many of their kind every time I gulped a mouthful of lake water or toweled off after a swim. Joining them in the gentle flurry of debris are leaves, twigs, and puffs of pollen from the forest. Mushroom spores, insect wings, and translucent grains of beach sand from the shore. Genes and bones from fish and turtles, and the gleaming glassy shells of microscopic diatom algae. I lean over the gunwale to look through the wavering halo of sunbeams that surround my silhouette, imagining the detritus of life settling like snow beneath me. Each successive layer represents a page in the history of the lake and its surroundings. When our free-diving friend next plants his head in the soft brown ooze of the main basin, his scalp will push through decades of accumulated crud. We deploy the smaller of two core samplers first, in order to confirm that we are positioned far enough from the Nitella meadows to avoid clogging the core barrel with fibers. Rory and Elliott lower the sampler hand over hand until they feel the line go limp. When it splashes aboard moments later, Rory holds it upright to avoid disturbing the loose, flocculent surface layers. The core is as long as her forearm and resembles a tube of chocolate pudding. No sign of Nitella here, so we stow the first sample and lower a longer, heavier, homebuilt device overboard. This one is equipped with a counterweight that feels the bottom and triggers a release mechanism just before the base of the core barrel meets the mud. Moments later, 33 inches 84 centimeters of lake history break the surface. The results of previous coring studies suggest that this sample represents about 1, years, which carbon dating of the mud will later confirm. I can link the two strata with the span of two hands, a distance that will eventually shorten down there on the lake bed as new, watery mud gradually compresses under the weight of future layers. I return to Walden again in December The day is unseasonably warm and windless, and the reflected images of clouds are sharp and clear as they glide slowly over the smooth surface. During the past year my students and I have been busy analyzing samples from our cores, but rather than sample the lake today I simply want to sit beside it. The low water level has exposed a sandbar at the mouth of the cove, inviting me to walk on it. The surface lies as still as the air, and bright sunlight flickers on and off through gaps in the mirrored clouds. Refocusing on the bottom, I scan the smooth pebbles of gneiss and quartzite amid the sand and imagine them tumbling in glacial rivers. Leaning closer, I wait until the water itself comes into focus and just barely make out a tiny speck of a copepod motoring about in search of a meal or a mate. For the first time in the history of the planet a species has produced an entirely new kind of waste. I wonder how it would feel to sit here with Thoreau, staring together into Walden Pond. Would we see the same things in it? Probably not, but I suspect that we would enjoy sharing our impressions nonetheless. Its thin current slides away, but eternity remains. I let my imagination sink down to the submerged sediment layer of this present moment, then deeper still. There are layers upon layers of stories stacked under this lake, and any individual increment of mud is just one of many pages in the epic of human existence. It reminds me that all lives are finite and makes me feel less alone in my own encounters with mortality. The long geological history preserved here reveals a deep human connection to the natural world that also comforts me, one that philosophers such as Emerson who considered people to be separate from nature might not have fully appreciated. Untouched wilderness never really existed in North America, at least not since the large mammals vanished, and a Walden without Homo sapiens somewhere in the picture might be cleaner but also as artificial as a swimming pool. Envisioning the sediment records beneath the reflections helps me to clarify this truth and my own connection to the world in ways that words alone cannot. Echo soundings recently obtained by the Salem State University geologist Brad Hubeny suggest that the deposits beneath the eastern basin of Walden Pond are about 20 feet 6 meters thick. Imagine driving a core barrel all the way through those sediments and then leaning the core upright against the side of a two-story house so the top stands level with the eaves. Now imagine climbing a ladder to measure the entire length of that column, not in units of feet and inches but of lifetimes, each one lasting, say, a conservative 60 years. To get used to those unusual temporal units, consider some familiar time periods in these terms. Two and one-half such life spans separate us from Thoreau, for example, and only four separate us from the American Revolution. Six or seven life spans take us to the arrival of the Pilgrims in Plymouth and eight or nine take us to the first landing of Columbus in Hispaniola. For many people, those few life spans represent the history of America, but the imaginary sediment column puts that misconception into clearer perspective. It represents more than successive human lives.

7: Deep Time : A History of the Earth - Interactive Infographic

*The Deep Well of Time [Michael J. Dorer] on www.enganchecubano.com *FREE* shipping on qualifying offers. Bring the fun and energy of storytelling to your classroom or home with this comprehensive guide.*

Guests Arlie Hochschild is professor emerita in the sociology department at the University of California, Berkeley. Transcript Krista Tippett, host: One of the voices many have been turning to in recent years is Arlie Hochschild. She helped create the field of the sociology of emotion: When she published her book Strangers in Their Own Land: Anger and Mourning on the American Right in the fall of , it felt like she had chronicled the human dynamics that had now come to upend American life. Arlie Hochschild is wise about the role emotion plays on every side of our life together, in politics and beyond it. Caring, she insists, is not the same as capitulating. It just means being emotionally intelligent. We all need to be makers. If you want to make a social contribution and help build a public conversation about the big issues of the day, you have to really be good at emotion management. Arlie Hochschild is a professor emerita at Berkeley and was born in Boston, Massachusetts. You were the child of a Foreign Service officer, so it sounds like you grew up all over the world. I lived in Israel, from age 12 to 14 â€” very pivotal experience. Then Wellington, New Zealand. Then my folks were in Ghana, and I spent a summer in Ghana, but by then I was in college. Then they were in Tunisia. I was very fortunate, really, to get to experience all of that. Was there a religious or spiritual background to your childhood in your family or in those places? Yeah, I would say. My parents were very religious Unitarians. I think by the time I was 16, I had that message, but I felt something missing. Quakers, they were doers. I just want to summarize â€” and tell me if I get this wrong, but it feels important. I want to really dive deep into that the backdrop, in terms of how we analyze and address political and social dynamics, especially in a time of discord like this, where the sides become more defined, and everybody seems incomprehensible to everybody else. You describe in the book:

8: The Silmarillion Symphony Ep The Deeps of Time | Aaron Dunn

The Five Deeps expedition aims to explore the bottom of each of the world's oceans. The first stop is in Puerto Rico this December. which will be the first time people travel to the bottom of.

9: Understanding Deep Time

Written by master Montessori storyteller Michael Dorer, this comprehensive book includes 40 complete stories and journeys from the basics of storytelling to how to create your own stories.

Chapter 12. Changing Boats Women and farming B.B. Explosion, Volume 3 (B.B. Explosion) Professional microsoft sql server 2016 reporting services Working Together For Good Principle Lessons from Russia English silver, 1675-1825 Sherlock Holmes on the Western Front Growth of Crystals Volume 21 (GROWTH OF CRYSTALS Volume 21 (Growth of Crystals) The Concise encyclopedia of modern world literature. Creating a payment strategy Syntel placement paper 2017 Problem Solving Strategy Guide, Volume 2 for Nikolai/Bazley/Jones Intermediate Accounting, 10th Musical reminiscences of the Earl of Mount Edgcumbe Mineral water business plan in hindi Irata international code of practice Carolina Early Learning Activities Social differentiation of English in Cameroon Time Among the Navajo Gender identities and womens agency in early modern tithe dispute. 1812 and All That 451 The Haunted Burglar (1897 by W. C. Morrow On The Edge Of The Narrow Road Raymond Chandler in Hollywood The Revolutionary Vol. 1 V.8. The pioneers; or, The sources of the Susquehanna. Cultural democracy and ethnic pluralism The Media Writers Guide Hp alm 11.5 user guide Application of graph coloring Blue skies, no candy WPA <all caps Historical Records Survey Alfred Hitchcocks Mortal Errors Edit uments adobe pro Labour theory of value marx Gene structure annotation at PlantGDB Volker Brendel Hawaii Cooks From the Garden Mendsongs soulspace Pauls Journeys Lesson Guide (Take Your Students on a Cruise) Low-level wind shear