Lets take a quick look at some of the key points youll need to know in order to identify fossil-bearing rocks. Know your rock types: Fossils are typically found in sedimentary rocks, such as limestone, sandstone, and shale. These rocks form from the accumulation of sediments and organic materials over millions of years. Igneous and metamorphic rocks, on the other hand, are less likely to contain fossils due to the extreme temperatures and pressures involved in their formation. Examine the rocks surface: Fossils can often be identified by their distinct shapes and patterns on the rocks surface. Look for outlines or impressions of shells, bones, or plant material. Keep an eye out for irregularities and unusual textures that might indicate the presence of a fossil. Look for the signs of a fossils presence: Fossils often leave traces of their existence in the form of fossil casts or molds. These can appear as small, round nodules or elongated shapes within the rock. They may also be marked by a difference in color or texture compared to the surrounding rock. Ive been fascinated by fossil hunters who can walk out onto a gravel bar or a rocky beach, quickly scan the area and know which rocks contain fossils, and which rocks do not. Its like magic. How do they know!? It makes me wonder how many rocks Ive thrown or tossed aside that might have actually contained a complete crab fossil or a whole ammonite. If youre like me, then youre in the right place. Today Im exploring the fascinating world of fossils and taking a look at how to identify rocks that may contain these hidden treasures. What Ive learned is that with the right knowledge and a keen eye, anyone can learn to point out these fossil containing rocks. Mamlambo, a renowned fossil expert, has shared his insights on this captivating subject in a short, must-watch video on his YouTube channel, MamlamboFossils. In this video he breaks down the process of identifying the types of rocks that contain fossils. And he does so by using an example of a rock he found that contains a crab fossil. Watch The Videos Here Then, in this next video, Mamlambo goes into more detail and further explanation of how he knows that a rock contains a fossil. In addition to this, he answers these three questions: How did he know there was a crab inside the rock? How did the crab get in the rock? Why is it in such good condition? As you set out on your fossil-hunting journey, remember that patience and persistence are key. With the right skills and knowledge, youll be well on your way to unearthing the secrets of Earths ancient past. Dont miss all of Mamlambos other informative and engaging fossil videos! You can find them here. Share Tweet Share Share Discovering a rock that holds a fossil is like uncovering a secret story from the past. Imagine holding a tangible connection to life that thrived millions of years ago. But how can you tell if a rock you find might be hiding this incredible treasure? Its all about knowing what signs to look for. Not every rock has a fossil inside, but this expert guide will help you figure out which ones do. Well explore useful tips to help you identify potential fossil-bearing rocks amidst everyday rocks!To tell if a rock has fossils inside, youll want to keep an eye out for some key indicators. Whether youre out on a hike, strolling along a riverbed, or just exploring your backyard, knowing these signs can turn an ordinary walk into an exciting hunt:Vertebrae imprint on a rock photo provided by Richard hawkeWhen youre hunting for fossils, noticing the texture is key. Fossils often have a different feel than the rest of the rock. Imagine the rock as a big chunk of chocolate and the fossil is like a crunchy cookie hidden inside. If one part of the rock feels rough, grainy, or has a pattern that seems out of place, you might be onto something exciting. These texture changes can show you where a plant or animal from long ago left its mark. By paying close attention to how the rock feels under your fingers, you can uncover fossils within a rock.Ammonite fossils photo provided by LiamSpotting unusual shapes in rocks can be your big clue that a fossil might be hiding inside. Think about how most rocks you see dont have parts that look like leaves, shells, or bones. But if you find a rock with shapes that remind you of something living, like a spiral that looks like a snails shell or a pattern that looks like fish scales, you might have found a fossil! These shapes have been preserved for ages. By looking for them, youre on your way to discovering a piece of the past.Phacodus Punctatus Ray Finned Jaw Teeth on a matrix photo provided by Fossil Age MineralsSometimes, a fossil inside a rock has a different color than the rest of it. This can happen because, over millions of years, the fossil and the rock around it might have changed in different ways. Imagine finding a rock where one part is a bit darker or lighter than everything else. That could be a sign that theres something special hidden inside. This clue is especially handy when the shape or texture doesnt stand out much.Crocodile bone block photo provided by Yorkshire FossilsFossils can be harder or softer than the rock theyre in because, over time, theyve turned into stone in a different way than the rock around them. When you gently touch different parts of a rock, you might notice some spots feel tougher or easier to scratch. This could be your clue that a fossil is hiding there. The next time you pick up a rock, dont just look at itfeel it all over for parts that may be a bit harder than the rest.Lepidodendron imprint on a rock photo provided by PebblefingersSearching for surface patterns on a rock can be a big hint that theres a fossil inside. Some fossils leave behind patterns that look like the original plant or animal. If you see lines that remind you of tree bark, circles like fish scales, or shapes that look like leaves or shells, these are clues.These patterns are the fossils way of showing us what was once alive, long ago. They got pressed into the rock and turned into stone, leaving behind a snapshot of ancient life.Asaphid trilobites on a plate photo provided by Fossilera @fossileraWhen you pour a little water on a rock, it can make hidden details pop out. This happens because water can darken the rock and make contrasts stronger. If theres a fossil inside, its shape, texture, or pattern might become easier to see with the rock wet. This trick is especially handy when youre outdoors and have a water bottle with you. Just a little splash can help reveal secrets from the ancient world hidden inside ordinary-looking rocks.Graptolite fossil photo provided by and available for purchase at FossilBucketLooking in the right places can seriously up your chances of finding a fossil inside a rock. While were not pinpointing specific spots, knowing that certain types of rocks are more likely to have fossils helps a lot. Sedimentary rocks, like sandstone, limestone, and shale, are the hot spots for fossils. These rocks form in layers, which can trap plants and animals and preserve them as fossils. So, when youre out exploring, keep your eyes peeled for these kinds of rocks.Reedops trilobite on a matrix photo provided by FossiliciousFossils can change a rocks weight, so paying attention to how heavy a rock feels can give you a hint about whether theres a fossil inside. Imagine holding a rock that seems heavier or lighter than it looks like it should be. That surprise in weight could mean something special is inside. Next time you pick up a rock, take a moment to feel its weight. If it doesnt match up with what you expect, you might just have found a clue leading you to a fossil.Ammolite fossil on shale matrix photo provided by Fossil Realm @fossilrealmNoticing any shine or gloss on a rock could be a clue that theres a fossil inside. Its like when you find a pebble at the beach that shines more than the others.Some fossils, especially those from shells or bones, can leave parts of the rock looking a bit shinier than youd expect.If you pick up a rock and part of it catches the light, making it sparkle or shine more than youd expect, its worth a closer look. Unlike relative dating methods, absolute dating methods provide chronological estimates of the age of certain geological materials associated with fossils, and even direct age measurements of the fossil material itself. To establish the age of a rock or a fossil, researchers use some type of clock to determine the date it was formed. Geologists commonly use radiometric dating methods, based on the natural radioactive decay of certain elements such as potassium and carbon, as reliable clocks to date ancient events. Geologists also use other methods - such as electron spin resonance and thermoluminescence, which assess the effects of radioactivity on the accumulation of electrons in imperfections, or "traps," in the crystal structure of a mineral - to determine the age of the rocks or fossils. All elements contain protons and neutrons, located in the atomic nucleus, and electrons that orbit around the nucleus (Figure 5a). In each element, the number of protons is constant while the number of neutrons and electrons can vary. Atoms of the same element but with different number of neutrons are called isotopes of that element. Each isotope is identified by its atomic mass, which is the number of protons plus neutrons. For example, the element carbon has six protons, but can have six, seven, or eight neutrons. Thus, carbon has three isotopes: carbon 12 (12C), carbon 13 (13C), and carbon 14 (14C) (Figure 5a). Figure 5:Radioactive isotopes and how they decay through time.(a) Carbon has three isotopes with different numbers of neutrons: carbon 12 (C12, 6 protons + 6 neutrons), carbon 13 (C13, 6 protons + 7 neutrons), and carbon 14 (C14, 6 protons + 8 neutrons). C12 and C13 are stable. The atomic nucleus in C14 is unstable making the isotope radioactive. Because it is unstable, occasionally C14 undergoes radioactive decay to become stable nitrogen (N14). (b) The radioactive atoms (parent isotopes) in any mineral decay over time into stable daughter isotopes. The amount of time it takes for half of the parent isotopes to decay into daughter isotopes is known as the half-life of the radioactive isotope. Most isotopes found on Earth are generally stable and do not change. However some isotopes, like 14C, have an unstable nucleus and are radioactive. This means that occasionally the unstable isotope will change its number of protons, neutrons, or both. This change is called radioactive decay. For example, unstable 14C transforms to stable nitrogen (14N). The atomic nucleus that decays is called the parent isotope. The product of the decay is called the daughter isotope. In the example, 14C is the parent and 14N is the daughter. Some minerals in rocks and organic matter (e.g., wood, bones, and shells) can contain radioactive isotopes. The abundances of parent and daughter isotopes in a sample can be measured and used to determine their age. This method is known as radiometric dating. Some commonly used dating methods are summarized in Table 1. The rate of decay for many radioactive isotopes has been measured and does not change over time. Thus, each radioactive isotope has been decaying at the same rate since it was formed, ticking along regularly like a clock. For example, when potassium is incorporated into a mineral that forms when lava cools, there is no argon from previous decay (argon, a gas, escapes into the atmosphere while the lava is still molten). When that mineral forms and the rock cools enough that argon can no longer escape, the "radiometric clock" starts. Over time, the radioactive isotope of potassium decays slowly into stable argon, which accumulates in the mineral. The amount of time that it takes for half of the parent isotope to decay into daughter isotopes is called the half-life of an isotope (Figure 5b). When the quantities of the parent and daughter isotopes are equal, one half-life has occurred. If the half life of an isotope is known, the abundance of the parent and daughter isotopes can be measured and the amount of time that has elapsed since the "radiometric clock" started can be calculated. For example, if the measured abundance of 14C and 14N in a bone are equal, one half-life has passed and the bone is 5,730 years old (an amount equal to the half-life of 14C). If there is three times less 14C than 14N in the bone, two half lives have passed and the sample is 11,460 years old. However, if the bone is 70,000 years or older the amount of 14C left in the bone will be too small to measure accurately. Thus, radiocarbon dating is only useful for measuring things that were formed in the relatively recent geologic past. Luckily, there are methods, such as the commonly used potassium-argon (K-Ar) method, that allows dating of materials that are beyond the limit of radiocarbon dating (Table 1). Name of Method Age Range of Application Material Dated Methodology Radiocarbon 1 - 70,000 years Organic material such as bones, wood, charcoal, shells Radioactive decay of 14C in organic matter after removal from bioshpere K-Ar dating 1,000 - billion of years Potassium-bearing minerals and glasses Radioactive decay of 40K in rocks and minerals Uranium-Lead 10,000 - billion of years Uranium-bearing minerals Radioactive decay of uranium to lead via two separate decay chains Uranium series 1,000 - 500,000 years Uranium-bearing minerals, corals, shells, teeth, $CaCO_3$ Radioactive decay of 234U to 230Th Fission track 1,000 - billion of years Uranium-bearing minerals and glasses Measurement of damage tracks in glass and minerals from the radioactive decay of 238U Luminescence (optically or thermally stimulated) 1,000 - 1,000,000 years Quartz, feldspar, stone tools, pottery Burial or heating age based on the accumulation of radiation-induced damage to electron sitting in mineral lattices Electron Spin Resonance (ESR) 1,000 - 3,000,000 years Uranium-bearing materials in which uranium has been absorbed from outside sources Burial age based on abundance of radiation-induced paramagnetic centers in mineral lattices Cosmogenic Nuclides 1,000 - 5,000,000 years Typically quartz or olivine from volcanic or sedimentary rocks Radioactive decay of cosmic-ray generated nuclides in surficial environments Magnetostratigraphy 20,000 - billion of years Sedimentary and volcanic rocks Measurement of ancient polarity of the earth's magnetic field recorded in a stratigraphic succession Tephrochronology 100 - billions of years Volcanic ejecta Uses chemistry and age of volcanic deposits to establish links between distant stratigraphic successions Table 1. Comparison of commonly used dating methods. Radiation, which is a byproduct of radioactive decay, causes electrons to dislodge from their normal position in atoms and become trapped in imperfections in the crystal structure of the material. Dating methods like thermoluminescence, optical stimulating luminescence and electron spin resonance, measure the accumulation of electrons in these imperfections, or "traps," in the crystal structure of the material. If the amount of radiation to which an object is exposed remains constant, the amount of electrons trapped in the imperfections in the crystal structure of the material will be proportional to the age of the material. These methods are applicable to materials that are up to about 100,000 years old. However, once rocks or fossils become much older than that, all of the "traps" in the crystal structures become full and no more electrons can accumulate, even if they are dislodged. John cannot control his excitement as he rides the bus to visit a natural history museum for the first time. He is only 11 years old, but he has seen many pictures of dinosaurs and other ancient animals in books. He cant wait to see the animals ancient bonesespecially the giant mammals and dinosaurs.As John walks through the museum, he first encounters a mammotha giant hairy elephant with long, curved tusks. The mammoth is about to be pounced on by a large cat with huge knife-like caninesa saber-toothed cat called Smilodon. As John continues his walk through the museum halls, he sees all kinds of ancient creatures.There are three-toed horses (Hipparion), a giant sloth (Thalassocnus), a giant elephant with a small trunk and two tusks on its chin (Deinotherium), and even a walking whale called Ambulocetus! Natural history museums are filled with thousands of interesting creatures that once walked on the same land we do today. For ancient animals like these to end up in museums, they first have to be preserved as fossils.Preserving ancient creaturesThe fossils that sit in museums represent a very small number of the species that have walked the Earth. This is because most of an animals body is destroyed when it dies. This is especially true for soft tissues, like hair or skin, and even tiny bones. Bones and teeth are more likely to be preserved in the fossil record. Footprints, shells, and molds are sometimes found as well. For these remains or traces of ancient animals to be turned into fossils, the organism must be buried. A quick burial, little disturbance after burial, and no oxygen in contact with the carcass usually lead to a high quality of preservation.There are rare cases in which fossils are found with skin, organs, or hair preserved. In these rare cases, fossils have been found frozen in ice or encased in amber (tree sap), like the insect in the Jurassic Park movies. Humans have also found ways to preserve remains so that they are in great condition thousands of years later, like the Egyptian mummies.Mummies can also occur naturally. Bogs and swamps have produced great fossils like the Tollund Man because of a soil called peat. The peat provides an acidic, cold, and oxygen-poor casing, which prevents the breakdown of the organism. However, most fossils are only bones or teeth that have turned to stone.Fossil detective: On the search for fossilsFor scientists, knowing what type of fossil you are searching for is the first step to finding one. Fossils can be found in many places on the Earths surface. However, because there is a lot of ground to cover, it is quite difficult to find them. To make it easier to find fossils, you need to know how and where to look. Luckily, there are clues all around, and a good fossil detective knows to ask the four Ws: who, what, when, and where. Who are we looking fordinosaurs, monkeys, or ancient human ancestors called hominins? What rocks are fossils found in? When were these fossils alive? Where can we find those fossils?Whose fossils are they looking for?Paleoanthropologists search for hominins, our ancient ancestors who first appeared around six or seven million years ago and evolved into us, Homo sapiens. So what do we know about hominins? We know they split from their common ancestor with chimpanzees in Africa about six or seven million years ago, based on genetic studies. Also, many early hominin fossils that date to the last six million years are found in East Africa. This helps us narrow down where to find them. But East Africa is a large area to coverto narrow it down even more, we need to look for the most likely places for bones or other traces to be preserved in the fossil record.What rocks hold fossils?Fossils are found in sedimentary rocks. For bones to become fossils, they have to be preserved by being buried and undisturbed for a long time in sediments. So, we need to find areas that bury bones fast and deep underground. This includes places near rivers or lakes.Geologists can look at sediments to determine where a lake or river was located back in ancient times. Different types of sediments give us clues as to how they were put there. For example, very fine sediments, like clays, are found at the bottom of lakes, while sands are found in rivers or beaches.Today, scientists know that the best chance of finding a hominin fossil is somewhere in East Africa and in areas where ancient rivers or lakes could have buried them. However, these areas can be very large, so we must figure out where in these areas those kinds of sediments are found and target the ones that are the same age as the fossils we want to find.The where and when of finding fossilsImagine that we are on a search focusing on the hominin species Australopithecus afarensis, which lived between 3.9 and 2.95 million years ago. To determine where to look for these hominin fossils, we can use geologic maps. These kinds of maps show where different rock types are found, and they show what the rock ages are on the surface.We are looking for near-lake or river-related sediments that are as old as our hominin, A. afarensis. To determine the age of rocks or sediments that the fossils are associated with, scientists analyze crystals that are found in the rocks or volcanic deposits within the sediments. Once we find a likely place on our geologic map, we then need to travel to that spot.Sometimes there is no geologic map. The next best approach for finding fossils without a geologic map is to travel around and find those sediments. Going out to these areas can also give you a sense for where on the landscape will be easiest to find fossils.For example, a very steep cliff or thickly vegetatedarea will be much harder to search, making it less likely to find fossils. An area with little to no vegetation, where rain can wash sediments away to expose fossils, will be a better area to spot fossils. Once we locate an area like that, we search intently by slowly walking over the land and looking for any trace of fossils. This may take a while, but if you find what you are looking for, the time and effort will be well worth it! Fossil hunting is a fascinating pastime enjoyed by families and individuals of all ages and levels of experience throughout the year. With just a little time spent learning the basics anyone can enjoy the thrill of finding evidence of prehistoric creatures and the environments they lived in. The following page offers some guidance to getting started, including the best places to look and techniques for fossil hunting effectively and safely. What is a fossil?Above: Roy Shepherd with an ammonite at Quantoxhead (Somerset)The modern use of the word fossil refers to the physical evidence of prehistoric life that is preserved from a period of time prior to recorded human history. There is no universally agreed age at which the evidence can be termed fossilised, however its broadly understood to encompass anything more than a few thousand years. Such a definition includes our prehistoric human ancestry and the ice age fauna as well as more ancient fossil groups such as the dinosaurs, ammonites and trilobites.Fossils occur commonly around the world although just a small proportion of former life made it into the fossil record, perhaps less than a billionth. Most living organisms simply decayed without trace after death. Thus, the abundance of fossils reflects the immense number of organisms that have lived and the vast length of time over which the rocks have accumulated. To read more about how fossils form click here.The earliest fossils discovered date from 3.5 billion years ago, however it wasnt until approximately 600 million years ago that complex multicellular life began to enter the fossil record, and for the purposes of fossil hunting the majority of effort is directed towards fossils of this age and more recent.The geologic timescale is divided into eras which are further divided into periods, of which the most frequently quoted is the Jurassic period (from the Mesozoic era) famous for the abundance of dinosaurs at this time. To view the geologic timescale click here.Where to look for fossils?Above: Fossil hunting on the beach at Hastings in East Sussex.The first step towards understanding where to look for fossils is to appreciate the distribution of fossil bearing rocks and the conditions that led to their formation and subsequent exposure. The rocks reveal the conditions present at the time of their formation and the forces that subsequently influenced their character.There are three primary rock types: sedimentary, formed from accumulated sediment, e.g. sand, silt and skeletal remains; igneous, formed from molten rock that has cooled and hardened; and metamorphic, sedimentary or igneous rocks that have been altered significantly by heat and/or pressure.Fossils are most commonly found within sedimentary rocks due to the favourable conditions of burial and limited alteration through time. Sedimentary rocks form on the Earths surface as sediment accumulates in rivers, lakes and on the seafloor in particular. Among the common sedimentary rocks include: sandstone, composed predominantly of grains of eroded rock; limestone, composed predominantly of shell debris and planktonic skeletons; and shale, formed from hardened clay (originally deposited as mud).Sedimentary rocks may undergo considerable change millions of years after deposition resulting in a new rock type, e.g. slate. These altered rocks are collectively known as metamorphic. Slate was originally laid down as a muddy sediment which was then compacted and hardened to form shale (a sedimentary rock), over time the shale was exposed to greater pressure and heat within the ground, a result of continental movement and/or tectonic activity. Over time the fabric of the shale was altered, replacing the original fabric and converting it to a metamorphic rock, consequently fossils within the slate are often flattened and distorted.On very rare occasions fossils can also be found within igneous rocks where molten rock escapes to the Earths surface and envelops organisms in its path, such as a tree. In this example if the molten rock cools and hardens in less time than it takes to turn the tree to ash, then the hardened rock may form a solid mould around the tree. Over a short period of time the tree tissues decay leaving an empty chamber inside the rock, some examples even preserve the texture of the outer bark on the walls of the mould.Having recognised unaltered sedimentary deposits as the main source for fossils, the next step is to understand where such rocks are located. Geology maps are a useful place to start as they reveal the age and type of rocks present at the surface; note that the surface rock is generally underlain by older rocks unless significant geological forces have caused buckling/folding of the landscape.Above: geological summary of northwest Europe indicating the age of the rocks. Source: IanWestAbove: A more detailed geology map indicating various sedimentary rocks of the UK. Source:BGSThe map above indicates the age of the surface rocks, colour coded according to the period in which they originally formed, for example the Jurassic (blue) 200-145 million years ago (mya) and Cretaceous (green) 145-65 mya. A map such as this is a useful starting point to understand the distribution of rocks and the type of fossils that might (or might not) be encountered. For example regardless of the conditions in which the rocks were formed, Pre-Cambrian rocks (red) which date from 542-488 years ago, wont contain reptile bones as this group did not evolve until much later. Likewise the ammonites are confined to the Jurassic and Cretaceous periods, at the end of which they became extinct. A knowledge of which organisms existed during which periods is useful.Having established the relevance of age to the prospect of finding certain fossil groups, the next step is to appreciate that age alone does not dictate which fossils may be encountered. Its useful to consider the variety of conditions simultaneously present today and apply these principles to the prehistoric world which had rivers, coastlines, seas, oceans and deserts just like today. Thus sediments of different types are laid down simultaneously and will ultimately contain different fossils groups, e.g. Jurassic limestones may contain ammonites, but Jurassic river sediments will not, as ammonites were exclusively marine. Similarly changes to the environment in a given area may dramatically alter the type of sediments deposited at a particular location. A vegetated region may produce coals, but a rise in sea level may flood the area leading to the deposition of sandstones.An example of this can be seen in the Early Cretaceous rocks of southeast of England which contain sandstones (formed near land in a delta-like environment) but are overlain by Late Cretaceous chalk (formed far from land at the bottom of the sea). The transition from sandstone to chalk represents a rise in sea levels (marine transgression) that took place globally towards the end of the Cretaceous period, submerging much of the land and reducing the supply of land sourced sediments; only the skeletons of plankton continued to accumulate to any great extent (forming chalk). Subsequently, the fossils in the sandstone are more likely to contain dinosaur bones whereas the chalk contains fossils of marine origin such as the ammonites and sharks.Once the basic geology of the area is understood the next step is to research locations where the bedrock is exposed, this isnt always easy, as inland outcrops are often obscured beneath soil and coastal locations may be inaccessible. Fortunately there are well documented locations where fossil collecting can take place, these include quarries and many coastal locations. Permission and insurance is usually required to access quarries, as such its best to accompany a local geology group who have existing relationships with the quarry operators and public liability insurance as well. Coastal locations on the other hand are usually accessible without permission unless stated otherwise.Where possible the locations featured on Discovering Fossils include as much geological information as is publicly available. To find a fossil location within the UK click here. Detailed geology maps and books are available on a regional and local level (as shown above) fromUKGE. Join us on a fossil hunt!Discovering Fossils guided fossil hunts reveal evidence of life that existed millions of years ago. Whether its your first time fossil hunting or youre looking to expand your subject knowledge, our fossil hunts provide an enjoyable and educational experience for all. To find out more CLICK HERE. What tools and equipment will you need?Above: Roy and Louis hammer a boulder in search of fossils at Seatown.Above: A hard-hat and high visibility jacket are a legal requirement in working quarries and a good idea anywhere where theres a risk of falling rocks, especially around cliffs.Fossil hunting can vary from a tranquil stroll on a beach in shorts and t-shirt during the summer, to extreme physical challenges in the depths of winter. As well as recognising the need to dress appropriately, its worth spending some time selecting the tools needed to assist you during the trip. Preparation in advance will help ensure your visit is productive and safe.For locations where the rock is hard a hammer and chisel combination are the most suitable tools, others prefer to use a geologists hammer in isolation, however this offers less control when extracting fossils. The hammer should be as heavy as can be easily managed without causing strain to the user, for individuals with less strength and children a head weight of 500g or less is recommended. A chisel is required in conjunction with a hammer for removing fossils from the rock a large chisel for completing the bulk of the work and a smaller, precise one for finer work. A chisel composed of cold steel is recommended as these are especially engineered for hard rock.While hammering rocks theres a risk of injury from rock splinters unless the necessary eye protection is worn. Safety glasses ensure any splinters are deflected away from the eyes. Eye protection should also be worn by spectators as splinters can travel several metres from their origin.For more information and examples of the tools and equipment recommended for fossil hunting click here.When is the best time to fossil hunt?Above: Fossil hunting after stormy weather can provide the best opportunity for finding fossils.Fossil hunting can be undertaken throughout the year, although the winter and spring tend to yield a greater volume of finds along coastal stretches due to the scouring action of the wind, rain and rough seas. During the summer, when the rate of erosion is generally lower, fossil collecting is more reliant on splitting prospective rocks or examining air-weathered surfaces.Regardless of the time of year, in coastal locations its best to coincide your visit with a falling tide. If the tide has already begun to rise upon your arrival then collecting will be confined to a limited area and time. Most coastal locations follow a 12 hour cycle, with low-tide occurring 6 hours after high-tide and then rising to high-tide 6 hours later. Local tide times (up to seven days in advance) are available on the BBCs website click here.How to fossil hunt safely?Above: A hard-hat is recommended in areas where falling rocks may occur.Above: Make a note of the tide times before you leave and avoid getting cut off.For the majority of time, when undertaken sensibly and with knowledge of the personal risks, fossil hunting is reasonably safe; however its not possible to eliminate all risk, as is the case with many other recreational activities too.Productive fossil collecting locations typically occur in areas with high rates of erosion, mostly due to natural forces and sometimes by the actions of people. In these areas youre likely to encounter unpredictable terrain including: falling rocks, slippery surfaces, areas prone to isolation by the incoming tide, steep drops and unstable surfaces. In extreme cases these hazards could result in serious injury.For more information about the hazards of fossil hunting and the precautions to take click here.Considerations before extracting a fossilAbove:Robert, Denise and Lucindaalongside a giant in situammonite at Peacehaven.In most instances fossils can be collected without causing unnecessary damage to the area or breaking the law; however, there are locations and instances where visitors must follow specific guidelines when collecting, especially Sites of Special Scientific Interest (SSSIs). An example of this would be the giant ammonites on the foreshore at Peacehaven which fall within the SSSI protection status. Its worth researching the area beforehand to understand the restrictions, where possible this information is outlined within each of the locations featured on Discovering Fossils.As a general rule fossils that are in situ (in their original position within the bedrock, beach platform or cliff-face) should not be collected. Extracting a specimen that is in situ can cause damage to the surrounding area, its also a much more complicated procedure and can result in irreparable damage if undertaken carelessly. There are possible exceptions to this rule, for example if the specimen is of scientific value and at risk of being damaged. In instances such as this, an experienced member of the scientific community should be consulted to offer support and advice; its best to avoid commercial collectors in these circumstances. Experienced, independent advice can be sought from Discovering Fossils, we also have contacts around the country who can help you.Extracting fossilsAbove: An echinoid has been pedestalled to help protect it during extraction using a hammer and chisel.Once a decision to extract a fossil has been reached the next step is to carefully plan an appropriate method of extraction. During the extraction the fossil is at its most vulnerable; the surrounding rock (matrix) can be unpredictable and crack or shatter when least expected. A well planned extraction reduces the risk of damage and takes into consideration the desired end result, i.e. how the specimen will be prepared and displayed. Its worth pausing for a moment and considering the various outcomes that may arise.In some cases it may be necessary to strengthen the specimen and/or surrounding matrix before progressing. For example its common to find naturally occurring cracks passing nearby, beneath or even through the fossil; a weak matrix might crumble during the extraction and must therefore be stabilised before progressing. A fast-setting superglue is a controversial technique but useful in these situations, providing essential stability before hammering. Note that overuse or misguided application can create irreversible damage to the specimen (children should be supervised at all times). As a general rule use as little glue as necessary and apply it as far from the specimen as possible a drip of liquid superglue will follow the crack unaided. Avoid allowing the glue to make contact with the surface of the fossil as it can be difficult to remove. Once the fossil and matrix are stable the extraction can take place.Its advisable to retain as much matrix around the specimen as possible as this will protect it during extraction and transportation. The example above shows a fragile echinoid shell exposed on an air-weathered chalk surface. Before removing the specimen a pedestal was created around the fossil, this was achieved using a hammer and sharp chisel to remove the matrix to within 3cm of the specimen and to a similar depth. The base of the pedestal provides a safe horizon below the specimen to undercut it, a few gentle taps releases the pedestal with the fossil undamaged on top.For fossils contained within softer rocks and clays a steel point can be used instead of a hammer and chisel. The example above shows a fragile gastropod shell being carefully extracted fromin situ. In this instance the matrix isnt desired and the shell can be removed safely and transferred to a padded container.For more information please refer to ourConserving Prehistoric Evidence guide.Transporting fossils safelyAbove: Foam wrap is the best all round material for protecting larger specimens in transit.Once the specimen has been extracted it needs to be carefully wrapped with foam or an equivalent such as newspaper, being careful not to crush it in the process. Before beginning observe whether the specimen is dry or wet, the aim is to maintain the fossil in its current state until it can be prepared at home. Rapid changes in water content resulting from drying or soaking can cause damage to the specimen. This is especially important for fossils found on the coast which require soaking to remove unwanted salt from the matrix and fossil; a fossil which has been allowed to dry in transit may be damaged when it comes to soaking.Place the fossil in the centre of a single sheet of foam and fold each of the corners over and specimen. Continue wrapping until the specimen is contained within a small parcel, apply as much foam as you feel necessary to prevent any damage occurring from knocks or bumps. To finish off use a couple of elastic bands to hold the foam in place. Sticky tape can also be used but is unsuitable in wet conditions.Recording key informationAbove: Simply positioning a finger in the photograph is an effective way of recording the position at which the fossil was found or originated from.Above: At Bracklesham Bay the buildings on the skyline are used as a landmark for future reference. Permanent landmarks are preferred if possible.Its good practice to document the locations at which fossils are discovered as this contributes to their scientific value. Keeping a record of the location and horizon (if known) makes the task of identifying fossils at a later stage less complicated; likewise if the specimen transpires to be a new species, these details will prove essential. An accurate record of the fossil will also be valuable to future recipients such as museums and other collectors.A digital camera is an effective tool for recording this information. Its worth taking multiple photos from different angles, capturing as much of the backdrop as possible and indicating using a finger the position at which the fossil was found. In addition to taking photographs, any specific information that cant be captured visually e.g. the formation or bed name (if known) should be noted on a paper pad.Once at home, the information gathered should be stored in a safe place and a corresponding label affixed to the underside of the specimen for easy reference.Basic fossil preparationAbove: A microscope is useful for conducting delicate preparation work.Above: Fossils recovered from coastal locations may require soaking to remove the salt.Having successfully retrieved the fossil the task of preparing it for study and display can begin. The process can be lengthy and complicated, but with practice the results can be truly outstanding, likewise some fossils require little preparation beyond basic stabilisation.As a large number of fossil collecting locations occur on the coast, salt contamination is the first threat that needs to be addressed. Salt naturally attracts water from the air, dissolving in the process and re-crystallising as the humidity reduces; conditions in a typical home or museum fluctuate frequently, accelerating the process. Left untreated salt crystals can cause long-term instability to the matrix and fossil. To remove the salt the specimen must be soaked in fresh water. Some materials however should not be soaked, as doing so can cause the matrix to disintegrate e.g. Gault Clay. Others, such as flint, are simply too dense to be affected by salt. If in doubt experiment on a small, unwanted piece of the matrix.If the fossil has been in transit or storage long enough to dry out, or was collected on a dry day, youll need to cover it with a wet kitchen towel or cloth, this will allow the water to be absorbed gradually. Try to avoid submerging dry specimens in water as rapid exposure is likely to shatter soft matrix and the fossil with it. You may need to leave the fossil covered for up to 48 hours, adding small amounts of water to the towel as required; a sealed container with a small amount of water in the bottom can assist the process. Once the moisture levels have been increased, carefully submerge the fossil in fresh water and soak it for 1-2 weeks (the longer the better), changing the water every few days to assist the process. Its a good idea to keep the container out of direct sunlight to prevent algae growth.Above: The moisture levels in this bivalve from Bracklesham Bay are increased gradually by wrapping it in a damp cloth and placing it in a few millimetres of water.Above: After 24 hours the fossil is saturated and can be safely submerged in water. The specimen suffered no damage as it was gradual moistened prior to soaking.Once the soaking is complete and the salt extracted the fossil can be removed and any remaining dirt or unwanted loose matrix brushed away, a soft bristled toothbrush is an effective tool in most instances. The specimen should be allowed to dry naturally away from any direct heat source. Small specimens may dry in a matter of days whereas larger examples may require a week or two. Keep a close eye on the specimen throughout the drying phase and consolidate (with a liquid superglue) any major cracks which may develop as the matrix contracts.With the specimen now clean and dry the next step should be to address any remaining cracks that may interfere with the further preparation. A few drips of fast setting liquid superglue is one possible solution (see below-left). For hairline cracks and to strengthen and protect surface details a dilute solution of Paraloid B72 in acetone can be applied, this also has the advantage of being removable at a later stage (unlike superglue which is permanent).Above: A thin liquid superglue is applied to consolidate the weak outer section of this mammoth tooth, being careful to avoid spilling onto the tooths surface.Above: Paraloid B72 dissolved in acetone is used to strengthen the fragile surface of the tooth; the excess can be easily removed with acetone at a later stage.Having stabilised the matrix and reduced the risk of cracks affecting the preparation area the delicate task of exposing the fossil can begin. The aim is to remove enough of the surrounding matrix in order to display the fossil as fully as possible without compromising its long-term stability. Moderation and control are required as over ambitious preparation can leave the fossil vulnerable to damage or cause it to fall apart.Depending on the particular specimen there are various preparation tools and techniques available. For specimens surrounded by relatively soft matrix such as chalk, much of the work can be undertaken with a simple metal tool a dental probe can be easily adapted to form an effective spear-shape digging tool (see example below-left). A microscope is useful for undertaking precision work, especially if the specimen is fragile.Above: A spear-shaped dental tool is used to remove chalk matrix from around a fish skull.Above: An air-abrasive removes chalk from the surface of an echinoid.For removing especially hard or large volumes of matrix a mechanical tool such as an air-abrasive (shown above) or an air-pen are effective choices. An air-abrasive dispenses a stream of abrasive particles under pressure which rapidly erode the matrix, albeit in a controlled way. Similarly an air-pen delivers effective results using a vibrating tungsten point to remove the matrix.For more information please refer to our Conserving Prehistoric Evidence guide.Reporting an important findAbove: One of many dinosaur footprints belonging to trackways discovered at Ardleyquarry near Oxford in 1997. Reported to various international organisations.Above: A well preserved cupedid beetle showing body and both elytra. Reported to Kent RIGS.Occasionally remarkable fossils are discovered, more often than not by an amateur fossil hunter. Its important that fossils of scientific value are reported to the relevant organisations in order that they can be considered for study, identification and safe extraction. If you think youve found something of scientific value please contact your local museum or a member of the Discovering Fossils team who will put you in contact with the relevant people.Donating fossils to a museumTriceratops skull at the Hunterian Museum in GlasgowChalk type fossils at the Booth Museum in BrightonLeft: A triceratops skull at the Hunterian Museum in Glasgow. Right: A drawer of type fossils from the Chalk at the Booth Museum in Brighton.There are instances where an individual fossil or private collection would benefit public understanding of the subject by residing in a publicly accessible location, such as a museum. Its not uncommon for private collectors to amass hundreds, even thousands of specimens, and while there are arguably benefits to this in the short-term, its important that the scientific and long-term future of the specimen(s) are also considered.For individual fossils that are known or suspected to be scientifically important, such as a new species or one that exhibits a unique or rare characteristic, its good practice to allow academics access to study and document it. This may also require that the specimen is made permanently available to other academics, in which case a donation to a relevant museum should be considered. Donations are sometimes provided in return for a plaster/resin replica if requested.A museum also makes a good permanent home for private collections after the owner has passed away. Although its a thought none of us likes to consider, its responsible to make plans for the collections future. The absence of a future plan could mean the collection falls into the wrong hands and is ultimately split up and sold to commercial dealers. The ideal museum is one that is major enough that the collection will be known to relevant scientists and ideally has a local/regional connection with where the specimens were found. If possible the museums curator and close friends and family should be notified of these plans in advance.For further advice or to discuss the donation of an individual specimen or collection please contact us.Recommended readingBelow are a selection of recommended books for the study of palaeontology in Britain and internationally as well. Some of the examples listed are no longer in print and will need to be sought from a second-hand supplier a quick online search usually provides several possible sources.The Geology of Britain an introduction, Peter Toghill, ISBN: 1840374047British Palaeozoic Fossils, The Natural History Museum, ISBN: 1898298718British Mesozoic Fossils, The Natural History Museum, ISBN: 1898298734British Caenozoic Fossils, The Natural History Museum, ISBN: 1898298777British Regional Geology (Series), British Geological Survey, ISBN: 0118844822 (Bristol and Gloucester example)A Dynamic Stratigraphy of the British Isles, R. Anderton, P. Bridges, M. Leeder and B. Sellwood, ISBN: 0412445107Vertebrate Palaeontology, M. Benton, ISBN: 9780632056378Fossil Invertebrates, R. Boardman, A. Cheetham, A. Rowell, ISBN: 0865423024 The trick to a successful search for fossils is finding the proper place. After all, paleontologists rarely select their sites at random. Instead, they consider an assortment of areas comparing the age and the accessibility of the rock prior to picking up their trowels.Most important in their considerations is the type of stone at a prospective search site, which is almost always sedimentary rather than igneous or metamorphic. The question is, why?While the formation of sedimentary rock is perfect for the preservation of fossils, the formation of igneous and metamorphic rock isnt so suited, resulting in the removal of the traces of ancient animals and plants. This is what youll want to know about the processes of rock formation and fossilization.Types of RockSpecialists say that there are three main types of rock, including igneous, metamorphic and sedimentary rock, which are all created through their own characteristic physical processes.Igneous and Metamorphic Rocks For instance, while igneous rocks form when the molten material from the planets core cools and sets as a single, solid mass, metamorphic rocksform when intense temperatures or pressures inside or outside of the planets crust transform the structure of an already formed stone.Sedimentary Rocks Alternatively, sedimentary rocks take shape when the tiny, weathered fragments of stones are compacted and cemented together.The process begins when rocks, minerals and organicmaterials such as shells are broken down into bits and transported to a new area by the forces of wind or water. Over time, as more of these sediments accumulate in the area, theyre compressed so tightly that they turn into a solid stone.Read More:What Are the Oldest Fossils in the World?Rocks with Fossils While the molten and partially molten materialthat make igneous rocks tend to wipe away the traces of ancient organisms, the temperatures and pressures producing metamorphic rocks typically obliterate any organic materials that they touch. As such, fossils usually only occur in sedimentary stones, where calmer conditions allow for the preservation of past life.Specialists say that these sedimentary fossils form when sediments such as silt, sand and shards of shell settle over the remains or other remnants of ancient animals and plants. That said, they add that it is also possible to find the occasional fossil in igneous and metamorphic stones, though it is a remarkably rare occurrence.For instance, volcanic blasts produce plumes of ash that occasionally bury organisms. Before their bodies are burned away by the torrents of magma, that are spewed onto the surface of the planet, they form a fossil in igneous rock. Alternatively, fossils sometimes appear in slabs of stone that are in the middle of metamorphosing. (As this transformation progresses, though, these fossils become increasingly distorted until theyre destroyed).Read More:Are the Oldest Fossils Real Or Just Rocks?Sedimentary Rocks with Fossils Overall, out of all of the separate subtypes of sedimentary rock, fossils are most abundant in shale, sandstone and limestone, though they also appear in conglomerates and breccias.ShaleShale, first and foremost, forms when the super-fine fragments of stones and minerals that are classified as silt settle and solidify. With fragments around 0.002 to 0.05 millimeters across, this type of sedimentary stone can preserve the traces of ancient animals and plants in incredible detail.According to specialists, shale tends to set in areas with shallow, slow-moving water. As a result, the fossils found in shale are typically small, aquatic animals and plants, such as bryozoans, brachiopods and arthropods.SandstoneSimilarly, sandstone is fashioned when the semi-fine fragments of stones and minerals that are classified as sand are collected and compressed. These fragments are typically around 0.05 to 2.0millimeters in diameter, meaning that the fossils found in sandstone deposits demonstrate far fewer fine details than those found in shale.Appearing in an assortment of terrains, including seas, streams, beaches, deserts and dunes, sandstone tends to feature a wider array of fossils, including small aquatic animals as well as larger land animals.LimestoneAlternatively, limestone forms when the accumulations of calcium carbonate, found inside bodies of water, crystalize or when the fragments of shells and corals (which are mostly made out of calcium carbonate) fuse together.Frequently featuring the traces of shelled sea creatures, limestone is commonly considered the most fossiliferous material on the planet. In fact, some chunks of limestone are almost completely composed out of fossils.Conglomerates and BrecciasFinally, conglomerates and breccias are created whenever coarse fragments of stone are consolidated together.While conglomerates tend to contain smooth sediments, breccias tend to contain sharp sediments. This means the fragments that comprise these two types of stone travel different distances before being deposited and condensed. But in both cases, the sediments that compose the structure of conglomerates and breccias measure more than 2.0 millimeters across and are not as prone to preserving fossils as the constituent materials of shale, sandstone and limestone.Read More: Take a Tour of These Incredible Living FossilsWhat Are Fossils?While this all provides paleontologists with an initial idea of where to look for fossils, these ancient treasures arent always so simple to identify. In fact, there are all sorts of fossils, which differ in their appearance depending on their process of preservation.Body FossilsFor instance, body fossils are the fossils that feature bits of the actual bodies of ancient animals and plants, and theyre what people tend to imagine when they think of fossils. They typically form when an organisms body is buried by sediment and saturated with water. Once saturated, the organic material in the body is steadily supplemented or swapped with minerals from the water, which slowly solidify, turning the body to rock.Being best suited for the preservation of bone and shell, these particular processes of fossilization tend to pass over the softer bits of the body, such as skin. That being said, there are some instances of softer tissues being preserved, with fossils demonstrating different degrees of decomposition.Impression and Trace FossilsOther fossils form when organisms are buried before decaying, creating casts of their bodies. Others still form when the traces of an animals activity, such as its footprints or its feces, are preserved rather than the remains of the animal itself.Respectively referred to as impression and trace fossils, these types of fossils represent a few of the most prevalent processes of fossilization, alongside body fossilization. And, of course, despite all of the differences between these processes, specialists stress that all three types of specimen are best found by searching through the sediment.Read More:We Owe Our Lives to 3-Billion-Year-Old Stromatolite Fossils

How to look for fossils in rocks. How to find fossils in sedimentary rock. How to get fossils out of rocks. Where can you find fossils in rocks. How to find fossils in river rocks. Find fossils. How to find fossils in beach rocks. How to find fossils in rocks for beginners. How to find rocks with fossils in them.