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Chapter 1 : What's in a name? 11 Sea Creatures that Look Exactly How They Sound

The wind WHISTLES, sea lions BELLOW, and tugboats RUMBLE. Little ones will delight in turning the sturdy pages of these books full of sound. The What's That Sound? board books serve a dual purpose for inquisitive little ones.

This error was later rectified by Laplace. Measurements were made of gunshots from a number of local landmarks, including North Ockendon church. The distance was known by triangulation , and thus the speed that the sound had travelled was calculated. Sound passes through the system by compressing and expanding the springs, transmitting the acoustic energy to neighboring spheres. In a real material, the stiffness of the springs is known as the " elastic modulus ", and the mass corresponds to the material density. Given that all other things being equal ceteris paribus , sound will travel slower in spongy materials , and faster in stiffer ones. Effects like dispersion and reflection can also be understood using this model. Similarly, sound travels about 1. At the same time, "compression-type" sound will travel faster in solids than in liquids, and faster in liquids than in gases, because the solids are more difficult to compress than liquids, while liquids in turn are more difficult to compress than gases. Some textbooks mistakenly state that the speed of sound increases with density. This notion is illustrated by presenting data for three materials, such as air, water and steel, which also have vastly different compressibility, more which making up for the density differences. An illustrative example of the two effects is that sound travels only 4. The reason is that the larger density of water, which works to slow sound in water relative to air, nearly makes up for the compressibility differences in the two media. Standing at the base of the western end of the Castle Rock, the sound of the Gun can be heard through the rock, slightly before it arrives by the air route, partly delayed by the slightly longer route. Compression and shear waves[edit] Pressure-pulse or compression-type wave longitudinal wave confined to a plane. This is the only type of sound wave that travels in fluids gases and liquids. A pressure-type wave may also travel in solids, along with other types of waves transverse waves , see below Transverse wave affecting atoms initially confined to a plane. This additional type of sound wave additional type of elastic wave travels only in solids, for it requires a sideways shearing motion which is supported by the presence of elasticity in the solid. The sideways shearing motion may take place in any direction which is at right-angle to the direction of wave-travel only one shear direction is shown here, at right angles to the plane. Furthermore, the right-angle shear direction may change over time and distance, resulting in different types of polarization of shear-waves In a gas or liquid, sound consists of compression waves. In solids, waves propagate as two different types. A longitudinal wave is associated with compression and decompression in the direction of travel, and is the same process in gases and liquids, with an analogous compression-type wave in solids. Only compression waves are supported in gases and liquids. An additional type of wave, the transverse wave , also called a shear wave , occurs only in solids because only solids support elastic deformations. It is due to elastic deformation of the medium perpendicular to the direction of wave travel; the direction of shear-deformation is called the " polarization " of this type of wave. In general, transverse waves occur as a pair of orthogonal polarizations. These different waves compression waves and the different polarizations of shear waves may have different speeds at the same frequency. Therefore, they arrive at an observer at different times, an extreme example being an earthquake , where sharp compression waves arrive first and rocking transverse waves seconds later. In solids, the compression waves are analogous to those in fluids, depending on compressibility and density, but with the additional factor of shear modulus which affects compression waves due to off-axis elastic energies which are able to influence effective tension and relaxation in a compression. Equations[edit] The speed of sound in mathematical notation is conventionally represented by c, from the Latin celeritas meaning "velocity". For fluids in general, the speed of sound c is given by the Newtonâ€”Laplace equation:

Chapter 2 : Sound | Define Sound at calendrierdelascience.com

What is sound? Sound is created by a vibrating object. Sound travels as a wave through a medium, for example, a liquid (such as water), a solid (such as the seafloor), or a gas (such as air).

We live in a sea of sound but can we capture the essence of the ocean in a seashell? Dr Karl visits the seaside to see what he can hear. The shell needs the ambient or background sound to give you the ocean sound Source: It also gives grown-ups a feeling of benevolent omnipotence to pass the shell to kids, and to see the amazement on their faces. So what are you actually hearing in the shell? The answer is that you are hearing the local noises already around you, but altered by the shell â€" thanks to some clever physics. One popular but wrong explanation is that you are listening to your own blood coursing through you. This explanation might be based on the fact that you can sometimes hear the pulsing of blood as you lay your head onto a soft pillow. Press your ear to a shell and listen, then run around on the beach for a few minutes to increase the blood flow all through your body, and again listen to your magic shell. So now for a three-part explanation. When you blow air strongly through your pursed lips over the mouth of an empty bottle, you will hear a musical note. The sound is resonating in the bottle. You and I might call it a "bottle" â€" but a physical acoustician would call it a "resonant cavity". It also has quite an irregular shape â€" so it will resonate at many frequencies. In the same way, this acoustic filter or shell-near-the-ear dampens one frequency or pitch , and boosts other frequencies. In one study, in a typical noisy room, a cup was held to the ear and a tiny microphone held right next to the eardrum. But at double the frequency hertz , the sound heard was 16 decibels quieter. But to give you the ocean sound, the shell definitely needs the ambient or background sound. The second part of the explanation is that our human brain is superb at finding subtle patterns in the chaotic world around us. We can find animals in clouds, or the face of Jesus in a potato chip, or the Virgin Mary in a fencepost. The third part of the explanation is that we live in a sea of sound, but we mostly ignore it. This is similar to the phenomenon of being able to feel our socks and underwear for a few brief moments after we put them on. In the same way, our brain usually blocks most of the noise of the background buzz. So now we can put it all together. The shell close to your ear acts like the audio equivalent of yellow-tinted sunglasses. It changes the make-up of the sounds that continually assault our ears, and that we continually ignore. For example, it lets through more of one frequency, but less of another frequency. The brain tries to put a label on this new noise, and notices that you are near the ocean â€" so it labels this noise as "ocean". But some people find different patterns in seashell noise. It encourages you to listen carefully to the shell. First, they say, you should hear fragments of words, then words, and finally, whole segments of conversation.

Chapter 3 : Why do you 'hear the ocean' in a seashell? â€º Dr Karl's Great Moments In Science (ABC Scie

The speed of sound varies depending on the temperature of the air through which the sound moves. On Earth, the speed of sound at sea level â€" assuming an air temperature of 59 degrees Fahrenheit.

Closed-End Air Columns The goal of Unit 11 of The Physics Classroom Tutorial is to develop an understanding of the nature, properties, behavior, and mathematics of sound and to apply this understanding to the analysis of music and musical instruments. Thus far in this unit, applications of sound wave principles have been made towards a discussion of beats , musical intervals , concert hall acoustics , the distinctions between noise and music , and sound production by musical instruments. In Lesson 5, the focus will be upon the application of mathematical relationships and standing wave concepts to musical instruments. Three general categories of instruments will be investigated: A fourth category - vibrating mechanical systems which includes all the percussion instruments - will not be discussed. These instrument categories may be unusual to some; they are based upon the commonalities among their standing wave patterns and the mathematical relationships between the frequencies that the instruments produce. Resonance As was mentioned in Lesson 4 , musical instruments are set into vibrational motion at their natural frequency when a person hits, strikes, strums, plucks or somehow disturbs the object. Each natural frequency of the object is associated with one of the many standing wave patterns by which that object could vibrate. The natural frequencies of a musical instrument are sometimes referred to as the harmonics of the instrument. An instrument can be forced into vibrating at one of its harmonics with one of its standing wave patterns if another interconnected object pushes it with one of those frequencies. This is known as resonance - when one object vibrating at the same natural frequency of a second object forces that second object into vibrational motion. The word resonance comes from Latin and means to "resound" - to sound out together with a loud sound. Resonance is a common cause of sound production in musical instruments. One of our best models of resonance in a musical instrument is a resonance tube a hollow cylindrical tube partially filled with water and forced into vibration by a tuning fork. The tuning fork is the object that forced the air inside of the resonance tube into resonance. As the tines of the tuning fork vibrate at their own natural frequency, they created sound waves that impinge upon the opening of the resonance tube. These impinging sound waves produced by the tuning fork force air inside of the resonance tube to vibrate at the same frequency. Yet, in the absence of resonance, the sound of these vibrations is not loud enough to discern. Resonance only occurs when the first object is vibrating at the natural frequency of the second object. So if the frequency at which the tuning fork vibrates is not identical to one of the natural frequencies of the air column inside the resonance tube, resonance will not occur and the two objects will not sound out together with a loud sound. But the location of the water level can be altered by raising and lowering a reservoir of water, thus decreasing or increasing the length of the air column. As we have learned earlier , an increase in the length of a vibrational system here, the air in the tube increases the wavelength and decreases the natural frequency of that system. Conversely, a decrease in the length of a vibrational system decreases the wavelength and increases the natural frequency. So by raising and lowering the water level, the natural frequency of the air in the tube could be matched to the frequency at which the tuning fork vibrates. When the match is achieved, the tuning fork forces the air column inside of the resonance tube to vibrate at its own natural frequency and resonance is achieved. The result of resonance is always a big vibration - that is, a loud sound. Another common physics demonstration that serves as an excellent model of resonance is the famous "singing rod" demonstration. A long hollow aluminum rod is held at its center. Being a trained musician, teacher reaches in a rosin bag to prepare for the event. This is an example of resonance. As the hand slides across the surface of the aluminum rod, slip-stick friction between the hand and the rod produces vibrations of the aluminum. The vibrations of the aluminum force the air column inside of the rod to vibrate at its natural frequency. The match between the vibrations of the air column and one of the natural frequencies of the singing rod causes resonance. The familiar sound of the sea that is heard when a seashell is placed up to your ear is also explained by resonance. Even in an apparently quiet room, there are sound waves with a range of frequencies. These sounds are mostly inaudible due to their low intensity. This so-called background noise fills the seashell, causing vibrations within the seashell. But the seashell has a set of natural frequencies at which it will vibrate. If one of the frequencies in the room forces air within the seashell to vibrate at its natural frequency, a resonance situation is created. And always, the result of resonance is a big vibration - that is, a loud sound. In fact, the sound is loud enough to hear. So the next time you hear the sound of the sea in a seashell, remember that all that you are hearing is the amplification of one of the many background frequencies in the room. Resonance and Musical Instruments Musical instruments produce their selected sounds in the same manner. Brass instruments typically consist of a mouthpiece attached to a long tube filled with air. The tube is often curled in order to reduce the size of the instrument. The metal tube merely serves as a container for a column of air. It is the vibrations of this column that produces the sounds that we hear. The length of the vibrating air column inside the tube can be adjusted either by sliding the tube to increase and decrease its length or by opening and closing holes located along the tube in order to control where the air enters and exits the tube. Brass instruments involve the blowing of air into a mouthpiece. The vibrations of the lips against the mouthpiece produce a range of frequencies. One of the frequencies in the range of frequencies matches one of the natural frequencies of the air column inside of the brass instrument. This forces the air inside of the column into resonance vibrations. Woodwind instruments operate in a similar manner. Only, the source of vibrations is not the lips of the musician against a mouthpiece, but rather the vibration of a reed or wooden strip. The operation of a woodwind instrument is often modeled in a Physics class using a plastic straw. The ends of the straw are cut with a scissors, forming a tapered reed. When air is blown through the reed, the reed vibrates producing turbulence with a range of vibrational frequencies. When the frequency of vibration of the reed matches the frequency of vibration of the air column in the straw, resonance occurs. And once more, the result of resonance is a big vibration - the reed and air column sound out together to produce a loud sound. As the straw and the air column that it contained is shortened, the wavelength decreases and the frequency was increases. Higher and higher pitches are observed as the straw is shortened. Woodwind instruments produce their sounds in a manner similar to the straw demonstration. A vibrating reed forces an air column to vibrate at one of its natural frequencies. Only for wind instruments, the length of the air column is controlled by opening and closing holes within the metal tube since the tubes are a little difficult to cut and a too expensive to replace every time they are cut. Resonance is the cause of sound production in musical instruments. In the remainder of Lesson 5, the mathematics of standing waves will be applied to understanding how resonating strings and air columns produce their specific frequencies.

Chapter 4 : Sound Transmission in the Ocean - sea, depth, oceans, temperature, salt, system, wave, marin

Words that sound like music for all of us Of course, there will always be those who will compare it with a big pool of salt water, or, as many seamen say, the sea is a long, hard and dangerous job.

Read on to learn fun facts about these fascinating sea creatures: Jellyfish are almost 98 percent water, but watch out â€" their tentacles are covered with cells that contain stinging threads, and when the jellyfish encounters another creature, these threads uncoil to help it catch its dinner. Sailfish Sailboats might not be the fastest way to travel the ocean. The sailfish, however, is the fastest swimming animal. Some estimate that these fish can travel at up to 70 miles per hour kph! Their sails are usually folded when swimming but are reported to stand up when scared, excited, or when herding prey. Stonefish Whilst diving you might mistake the stonefish for rocks on the seabed. Five-armed sea stars are well-known but some â€" like the sun star â€" have up to 40! And, not only can these amazing critters regenerate lost arms, some can even create a whole new sea star from just a single arm and part of the central disc. Leopard Shark Leopards might be dangerous on land, but leopard sharks are harmless to humans unless provoked â€" their diet includes invertebrates such as crabs, clams, shrimp and octopus. Their name comes from their leopard-like markings which are as individual as fingerprints. Seahorse Much smaller than the horses you ride, sea horses can be as tiny as 0. They are very poor swimmers, so to prevent strong currents from washing them away, the sea horse uses its prehensile tail to grip onto weeds and grass. The snout â€" or rostrum â€" is used for catching prey, digging in sand and has electroreceptors to detect passing prey. Sea Snake Although evolved from its land-based counterpart, sea snake has adapted for marine life with an oar-shaped body and flattened tail to help it move easily under water, which makes it helpless on land. Trumpetfish The trumpetfish is a master hunter. It can change colours easily to blend in with the reefs, often pretending to be a branch of coral, and will hide in the shadow of large fish as a way to sneak up on its prey undetected. Yellow Boxfish Unsurprisingly, these guys get their name from being square in shape. Juveniles have bright yellow colouring which acts as a warning to predators, but which fades to a browner shade as they get older. When they get stressed or sick, the boxfish releases toxic proteins from its skin which can be lethal to any other fish in the surrounding water. Discover more about your favourite critters and their names with the Scuba Earth Critter Finder.

Chapter 5 : How would you describe the sound of waves? | Yahoo Answers

As StoneyB suggested, roar and crash of the surf are common calendrierdelascience.com is used in sense 4, "Generally, of inanimate objects etc., to make a loud resounding noise", and crash in sense 3, "A loud sound as made for example by cymbals".

The Sound , from Helsingborg , Sweden A sound is often formed by the seas flooding a river valley. This produces a long inlet where the sloping valley hillsides descend to sea-level and continue beneath the water to form a sloping sea floor. The Marlborough Sounds in New Zealand are a good example of this type of formation. Sometimes a sound is produced by a glacier carving out a valley on a coast then receding, or the sea invading a glacier valley. The glacier produces a sound that often has steep, near vertical sides that extend deep under water. The sea floor is often flat and deeper at the landward end than the seaward end, due to glacial moraine deposits. This type of sound is more properly termed a fjord or fiord. The sounds in Fiordland , New Zealand, have been formed this way. A sound generally connotes a protected anchorage. They can be part of most large islands. In the more general northern European usage, a sound is a strait or the most narrow part of a strait. In Scandinavia and around the Baltic Sea, there are more than a hundred straits named Sund, mostly named for the island they separate from the continent or a larger island. It is also a colloquial short name, among others, for Plymouth Sound , England. In areas explored by the British in the late 18th Century, particularly the northwest coast of North America, the term "sound" was applied to inlets containing large islands, such as Howe Sound in Vancouver and Puget Sound in Washington State. Pamlico Sound is a similar lagoon that lies between North Carolina and its barrier beaches, the Outer Banks , in a similar situation. The Mississippi Sound separates the Gulf of Mexico from the mainland, along much of the gulf coasts of Alabama and Mississippi. On the West Coast, Puget Sound , by contrast, is a deep arm of the ocean. Etymology[edit] The term sound is derived from the Anglo-Saxon or Old Norse word sund, which also means " swimming ". In Swedish and in both Norwegian languages , "sund" is the general term for any strait. In Swedish and Nynorsk , it is even part of names worldwide, such as in Swedish "Berings sund" and "Gibraltar sund", and in Nynorsk "Beringsundet" and "Gibraltarsundet". Puget Sound , as seen from the Space Needle Bodies of water called sounds[edit].

Chapter 6 : Speed of sound - Wikipedia

sound - a narrow channel of the sea joining two larger bodies of water. strait. channel - a deep and relatively narrow body of water (as in a river or a harbor or a.

Sound Transmission in the Ocean Sound Transmission in the Ocean The speed of sound depends on the medium through which sound waves propagate. The speed of sound differs in air and water, with sound waves traveling faster in water. In contrast, in salt water at approximately the same temperature, the speed of sound is approximately 1, meters 5, feet per second. The crew of Le Suroit prepare to launch deep-sea sonar in during a search for the wreck of the Titanic. Sonar sound navigation and ranging uses sound to locate and identify targets, whether shipwrecks, submarines, or schools of fish. The state properties of water temperature and pressure and the degree of salinity also affect the speed of sound. The propagation of sound waves in sea water can be directly affected by suspensions of particulate matter that can scatter, absorb, or reflect the waves. Laboratory experiments demonstrate that distilled waterâ€"water from which salts and other suspended particles have been removedâ€"provides a medium in which the speed of sound exceeds the speed of sound in ocean water. The difference in the speed of transmission is significantâ€"speed in distilled water may be 20 to 30 times that of speeds found in ocean water. Because frequency and wavelength are inversely proportional characteristics of sound waves, low-frequency signals produce long sound wavelengths. These long-wavelength signals encounter fewer suspended particles as they pass through the medium and thus are not as subject to scattering, absorption, or reflection. As a result, low-frequency signals are able to travel farther without significant loss of signal strength. Naval communication systems utilize low-frequency, long-wavelength signals to enhance communications with submerged submarines. Physical Differences Produce a "Sound Channel" Within the ocean, the speed of sound varies with changes in depth that accompany normal changes in temperature and pressure. Specific combinations of temperature, pressure, and salinity may act to create shadow zones, or reflective layers, that are resistant to the propagation of sound waves. A specific set of conditions, however, also act to create a channel through which sound waves propagate at minimal speed but with minimal loss of strength. Although the oceans are not uniform bodies of waterâ€"there are currents of water with dramatic variations of temperature such as the Gulf Stream and salinityâ€"the speed of sound in the deeper regions of the oceans is influenced more by high pressure. Conversely, at shallower depths, temperature plays the most dominant role in governing the speed of sound. The greater the temperature of the water, the faster sound travels. Surface temperature variation can be significant with seasonal variations in the amount of sunlight insolation that can produce changes in near-surface temperatures that, in turn, affect the speed of sound in water near the ocean surface. When the near-surface layer is well mixed by currents and surface action, a resulting isothermal layer allows uniform propagation speeds for sound waves. Such isothermal layers are common in mid-latitude regions. The resulting thermocline shows a characteristic decrease in the speed of sound with decreasing temperature. However, at a depth of approximately meters 2, feet , the variations in temperature become so slight that the water becomes essentially isothermal of uniform temperature. From that point, the speed of sound is regulated more by changes in pressure that accompany the increasing depth. Because sound wave transmission speed is directly proportional to pressure, the speed of sound increases as the pressure increases with depth. Accordingly, at the interface of the thermocline and the isothermal depths, there exists a region of minimal speed of sound. This interface creates a sound "pipeline," or "deep sound channel," within the oceans that allows the transmission of low-frequency sound over thousands of kilometers. Worzel, and independently by Soviet physicist Leonid Brekhovskikh. Ewing and Worzel demonstrated that the SOFAR channel was capable of transmitting the low-frequency, long-wavelength sound waves produced by an explosion near the Bahama Islands to receivers stationed near the coast of Africa. SOFAR channel depths also are a function of the depth and thickness extent of the thermocline. Temperature and pressure affect water density, and the refraction of sound waves occurs at the interface of mediums or layers within a medium of differing density. Because of refraction, sound waves traveling through the SOFAR channel are deflected toward a region of lower velocity. Accordingly, waves traveling upward toward the surface, where the speed of sound increases with increasing temperature, deflect downward. Waves traveling toward deeper water, where the speed of sound increases with increasing pressure, are deflected upward. Traveling at minimum velocity, the sound waves lose little energy, allowing the waves to propagate over distances in excess of 25, kilometers 15, miles. Prior to the widespread use of GPS global positioning system equipment, the SOFAR channel also was used for navigation and the location of marine craft. Some scientists hypothesize that certain species of whales utilize the SOFAR channel to communicate mating calls over long distances. Based on the known relationship of temperature changes to changes in the speed of sound, the Acoustic Thermometry of Ocean Climate ATOC project is attempting to provide data crucial to measurement of changes in global temperature. By measuring differences in the speed of sound transmitted over long distances such as across the Pacific basin , data accumulated over a long timeframe should average out variations in temperature and salinity, enabling ATOC scientists to calculate changes in ocean temperature that may provide evidence related to questions regarding global warming.

Chapter 7 : Sound Wave | Definition of Sound Wave by Merriam-Webster

A seal makes a sound that is a mixture of a bark and an eerie whaling sound, depending on the species of seal. Sea lions are known to bark whenever they come out of the water as they snort to clear their nostrils. The Weddell Seal has 34 different kinds of calls and can be heard for more than

Chapter 8 : What does SOUND mean?

In geography, a sound is a large sea or ocean inlet, deeper than a bight and wider than a fjord; or a narrow sea or ocean channel between two bodies of land (see also strait). [1] [2] There is little consistency in the use of "sound" in English-language place names.

Chapter 9 : Sound (geography) - Wikipedia

Sea Star While they come in various sizes and colours, all sea stars (sometimes called "starfish") are shaped like, you guessed it, a star. Five-armed sea stars are well-known but some - like the sun star - have up to 40!