Festival of Science Film 2008

scinema

Taking you places - National Science Week Aug 08

STUDY GUIDE

SCINEMA (pronounced with a long 'i' to emphasise the science behind the cinema) is a partnership of the CSIRO and Cosmos Magazine, with funding from DEST's National Science Week program, and ACT Department of Health. SCINEMA is a science film, video and multimedia festival, that presents a program of science drama, documentaries, and short subjects on topics ranging from climate change, human health and natural history, to broader social films.

Promoting and raising the public level of science literacy is the major driver behind the team who run SCINEMA. As such, we present this study guide to allow you to get the most value from our 2008 program. This guide helps explain some of the concepts covered, and suggests games and activities to help you exand on the learning from the films.

Sustainability

The issue of what kind of planet we will leave to future generations has been fascinating filmmakers since the environmental movement took off in the 1960s. SCINEMA presents two film that explore this challenge from different angles:

Waste = Food 50mins Holland. English subtitles
Director Rob Van Hattum Cinematographer Niels Van Hoff
and
After us the heavens can fall 52mins France.
Producer Jacques Vichet Director David Martin Cinematographer Macsine Soulard

WASTE = FOOD

Natural resources are being depleted on a rapid scale while production and consumption are rapidly rising in nations like China and India. With their enormous waste production, if nothing is done about it all our resources will be turned into one big landfill.

Luckily, scientists have developed a theory to prevent the disastrous effects of this built up waste- eliminate the idea of waste altogether. What if everything man-made was completely reusable? The Cradle to Cradle theory looks at creating products that are either completely biodegradable or recyclable. This way they enter the biosphere as 'food' for the earth, or enter the techno-sphere as 'food' for new products.

Each cycle is safe, with any toxic materials removed from the products to protect our fragile environment. Not only does this method rid the earth of waste, there are even biological benefits for the environment through the production of biodegradable resources.

In addition to the vast environmental benefits, the Cradle to Cradle system has proven to be profitable for the corporate world, with the introduction of environmentally friendly buildings saving businesses a substantial amount of money.

Questions

1. In what country was the idea of fully biodegradable fabric first developed?

2. How do the recyclable materials produced using the Cradle to Cradle idea differ from most of the recyclable products currently being used?

3. How will the Cradle to Cradle method of production benefit rapidly growing nations like China?

4. Listen to the language used in the film to describe the problem of sustainability. How does it describe the issue? How do you think society 100 years ago might have looked at us and the way we currently use resources? What technologies have been invented in that 100 year period that allowed us to feed our growing populations?

AFTER US HEAVEN CAN FALL

Over the past two centuries, people have released enormous quantities of carbon in the atmosphere - carbon which had taken millions of years to develop in the ground. Action is being taken to avert the catastrophic consequences global warming, but is enough happening to truly slow down climate change?

The greenhouse effect has always been an important phenomenon for the earth. Natural greenhouse gases keep heat from leaving the atmosphere, without which the average temperature on earth would be about 34˚C colder. In recent centuries, since the Industrial Revolution, humans have been adding vast quantities of greenhouse gases into the atmosphere. This includes the naturally occurring greenhouse gases such as carbon dioxide, but also harmful manmade gases such as hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. This has intensified the greenhouse effect and is causing the issue known as global warming.

'After Us Heaven Can Fall' looks at the different ways the earth will be affected by global warming; and with the natural climate cycle of the earth already altered, the importance of immediate action against global warming.

Group Activity

1. Discuss the meaning behind the title of the film, 'After Us Heaven Can Fall'.

2. List some everyday changes each person can make in their homes to reduce greenhouse gas emissions.

Further Reading and References

Real Climate
http://www.realclimate.org/

Natural Resources Defense Council – Global Warming Basics
http://www.nrdc.org/globalWarming/f101.asp

Climate Change | What is the greenhouse effect?
http://www.greenhouse.nsw.gov.au/what_is_climate_change/greenhouse_effect2

The Human Brain

This program features 2 documentary subjects and a short animation that explore the human brain, one quite literally, while the others look at health issues relating to the physical operation of the brain:

Expedition to the Brain 8mins Spain.
Producer and Director Pablo Garcia-Lopez
and

Unravelled 57mins USA.
Producer Jacqueline Gares Director Katrina Fullman
and

The Brain Fitness Program 58mins USA.
Producer Lennlee Keep Director Eli Brown Narrator Peter Coyote

EXPEDITION TO THE BRAIN

This gorgeous animation follows an explorer on his journey through the human body, where he discovers a complex and spectacular organ – the brain. The filmmaker has used historical photography and scanned images to fabriacte a journey that uses the human brain as a backdrop.

Activity

Have a look at the animation techniques employed by the filmmaker. Discuss how he might have achieved this technique.

What animation or puppetry styles does it remind you of? Write a script and a storyboard for a short animation that charts a journey through the human body.

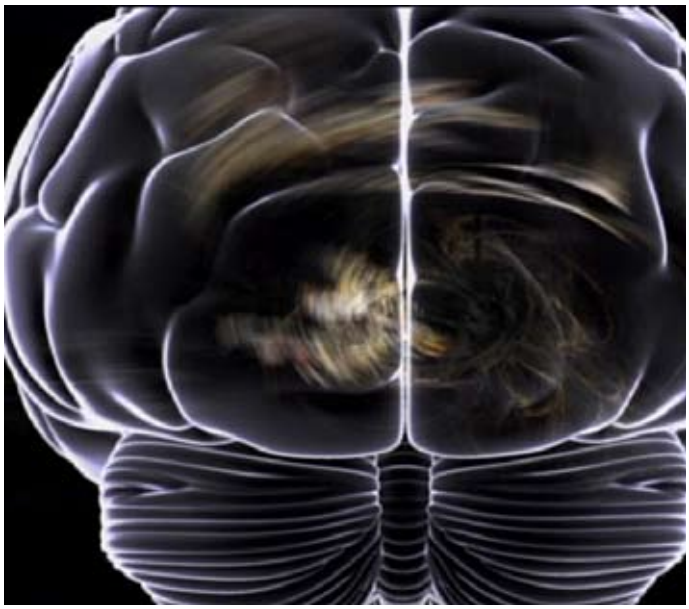
UNRAVELLED

Unravelled combines memoir with scientific investigation to tell you a story of family ties, inheritance and Alzheimer's disease.

Alzheimer's disease is a physical disease which attacks regions of the brain, resulting in memory loss and impaired thinking and behaviour. First described by German psychiatrist Alois Alzheimer in 1907, the illness causes abnormal material to build up in the brain as what are known as neurofibrillary tangles and senile plaques. This build up interferes with connections between brain cells, and leads to the death of these cells. Alzheimer's disease progresses slowly and there is no known cure.

There are two forms of the disease, Sporadic Alzheimer's disease and Familial Alzheimer's disease. Sporadic Alzheimer's is the most common form of the disease, and usually affects adults over the age of 65. Familial Alzheimer's is a rare form of the disease which is genetically inherited. If a person has inherited one of these rare genes they will usually develop Alzheimer's in their 40s or 50s.

Unravelled looks specifically at Familial Alzheimer's disease, and how investigating family history in the disease can determine the risk of developing this type of Alzheimer's.



Activity

Anna's father has been diagnosed Alzheimer's disease, and she has discovered other family members on her father's side who were diagnosed with the illness. Her mother does not have a family history of Alzheimer's. Familial Alzheimer's is inherited in an autosomal dominant trend, meaning that the presence of just one mutated gene is required to develop Alzheimer's disease. Complete this punnet square to determine the probability of Anna developing the disease.

	A	a
a		
a		

*The dominant, mutated gene is capitalised

Further Reading and References

Alzheimer's Australia
http://www.alzheimers.org.au/content.cfm?infopageid=439#wh

Alzheimer's Disease Genetics Fact Sheet
http://www.nia.nih.gov/Alzheimers/Publications/geneticsfs.htm

Educational brain fitness games for children
http://kidbraingames.com/

THE BRAIN FITNESS PROGRAM

Based on the concept of neuroplasticity, the Brain Fitness Program shows the power of the brain to change, adapt and rewire itself.

Neuroplasticity is the lifelong ability of the brain to rearrange neural pathways to coincide with any new skills we develop. When we learn something new, connections between neurons (synapses) associated with this skill are strengthened.

An interesting aspect of neuroplasticity is the brain's ability to reorganise itself. A skill which has been hindered by damage in a particular section of the brain can be regained through intensive therapy. The skill is repeated constantly, and the brain 'rewires' itself, reforming the connections that have been lost in another section of the brain.

The Brain Fitness Program looks specifically at how the concept of neuroplasticity can be used to slow mental aging. By challenging your brain, you can continue the process of neuroplasticity throughout life, which keeps the brain active and healthy.

Activity

Researchers have determined seven requirements for neuroplasticity to occur. Use the words below to fill in the empty spaces.

motivation wire mood temporary negatively connection two-way crucial

Tenets for Brain Plasticity

1. Change can occur only when the brain is in the _____.
2. Change strengthens _____ between neurons engaged at the same time.
3. Neurons that fire together, _____ together.
4. Initial changes are just _____.
5. Brain plasticity is a _____ street and we can either drive brain change positively or _____.
6. Memory is _____ for learning.
7. _____ is a key factor in brain plasticity.

Life on the Ice

How people live in and what attracts people to extreme environments are explored in this program of two documentaries:

When the ice is broken 14mins Turkey.
Producer Fejih Giftchi Director Meulut Giftci
and
Ice People 77mins USA.
Producer Benoit Grsypeerdt Director Anne Aghion

WHEN THE ICE IS BROKEN

Is life above the ice or below it? This short film follows a local community living traditionally on the ice. We observe the lives of ice fishermen involved in working long hours in a harsh climate, for little money and a continually depleting number of fish.

Group Activity

1. When the Ice is Broken uncovers some of the hardships of living in a poorer community. If the number is fish caught by the fishermen continues to decrease each year, what effect could this have on the community as a whole?

2. List and discuss any other major themes in the film.

3. The filmmaker allows the images to tell a story. Invent names and background stories for the characters in the film. Write a voice-over narration that draws out their characters and explains their relationships. Record the voiceover and play it with the film for your class.

ICE PEOPLE

Emmy-winning filmmaker Anne Aghion spent four months 'on the ice' with modern-day polar explorers, to find out what drives dedicated researchers to leave the world behind in pursuit of science, and to capture the true experience of living and working in this extreme environment.

We follow the every-day lives of scientists working in Antarctica; their passionate, groundbreaking research and their relationships with fellow scientists.

Before Watching the Film

For a better understanding of the research undertaken by scientists in the film, look into the geologic and climatic history of Antarctica. This site may help:

Antarctica: Geologic History (Dive and Discover)
http://www.divediscover.whoi.edu/antarctica/history.html

Visit the film website for more information about the production
http://www.icepeople.com/

Review Questions

1. How does investigating Antarctica's climatic history help us predict the effects of global warming in the future?

2. Why is field geology an important aspect of scientific research?

3. What are some of the aspects of Antarctica that attract scientists to the continent?

Origins of Man

Where did we come from is a question that continues to perplex scientists. SCINEMA looks at three different paths this search has taken:

Mungo Man 6mins Australia.
Producer and Director Kristian Lang
and
Who are your next of kin? 45mins South Africa.
Producer Job Kiboo Director Guy Spiller
and
So where do we come from? 38mins Germany.
Producer Astrid Kassel Director Benedikt Bjaranson

MUNGO MAN

Estimated to have died approximately 40,000 years ago, Mungo Man is a human-like primate whose remains were found in Lake Mungo, New South Wales in 1974. His remains suggested a ritual burial, and make the burial oldest known ceremonial burial in the world. The Mungo Man has also challenged the widely accepted version of how humans developed and spread around the world.

Scientists have extracted mitochondrial DNA from the remains, and found that the Mungo Man's DNA bore no similarity to other ancient skeletons, a finding which opposes the Out Of Africa theory of Human evolution. According to this theory, modern humans evolved in Africa between 150,000 and 100,000 years ago, with one group leaving Africa by 60,000 years ago and replacing all earlier human populations such as Homo erectus and Neanderthals. If this theory is completely accurate, the Mungo Man should have DNA resembling every other modern human thought to have come from Africa. The DNA findings, however, oppose this theory. Scientists have concluded that although the man is completely anatomically modern, he came from a genetic lineage that is now extinct.

Group Activity

Discuss the three theories outlined in the film, and some evidence found which opposes and complies with each theory.

What would the Australia that Mungo Man lived in have looked like? Break into groups and research and present a poster on the fauna of Australia 40,000 years ago - how has it changed and why? What animals lived in Australia at this time? A large number of them are extinct - can you explain why? What animals form this time do we still have around today? Why might they have survived where others haven't?

Further Reading and References

Mungo Man – The missing link?
http://www.convictcreations.com/aborigines/prehistory.htm

Mungo Mania
http://www.abc.net.au/science/slab/mungoman/default.htm

WHO ARE YOUR NEXT OF KIN?

A film about Icelandic family relations and the search for the filmmaker's own roots on the island.

Genealogy is an integral part of the Icelandic culture — approximately 80% of all Icelandic people who have ever lived can be traced on family trees. With records dating back to the ninth century, Icelanders can discover fascinating details about their ancestry.

Thanks to the records kept in Iceland, the genetic distance between people is known. This, along with the relatively small population in the country and detailed medical records, makes Iceland an excellent candidate for population genome studies. The information can be used to look for clues to genetic and environmental causes for different diseases.

Activity

Collect information about your family history by interviewing family members. Use this information to make your own family tree.

SO WHERE DO WE COME FROM?

An extra-ordinary journey of discovery which takes the viewer back through time to discover the fascinating routes that South Africa's diverse population has followed.

So Where Do We Come From focuses on the widely accepted theory of human evolution, the Out Of Africa theory. The theory suggests that all humans stem from a single group of Homo sapiens who emigrated from Africa 2,000 generations ago and spread throughout the world over thousands of years. These settlers replaced other early humans such as Neanderthals.

Genetic studies have validated the theory, as mitochondrial DNA from modern humans, which is passed on only from mother to child, shows a maternal lineage tracing back to one common ancestor. This ancestor is known as Mitochondrial Eve. Likewise, scientists have found that all male humans have inherited Y chromosomes from one common ancestor known as Y-chromosomal Adam.

Questions

1. Why do scientists look at mitochondrial DNA when determining maternal lineage?

2. Research other theories of human evolution. Why is the Out Of Africa theory so widely accepted?

Further Reading and References

Origins of Modern Humans: Multiregional or Out of Africa?
http://www.actionbioscience.org/evolution/johanson.html

Rediscovering Biology – Human Evolution
http://www.learner.org/channel/courses/biology/textbook/humev/humev_5.html

To the Moon and Back

Lunacy 6mins Australia.
Producer and Director Kristian Lang
and
Bigger than big 45mins South Africa.
Producer Job Kiboo Director Guy Spiller
and
The wonder of it all 38mins Germany.
Producer Astrid Kassel Director Benedikt Bjaranson

The Solar System

The solar system consists of everything that orbits (circle) the sun, including, comets, planets, asteroids and moons (bodies that orbits around other planets).

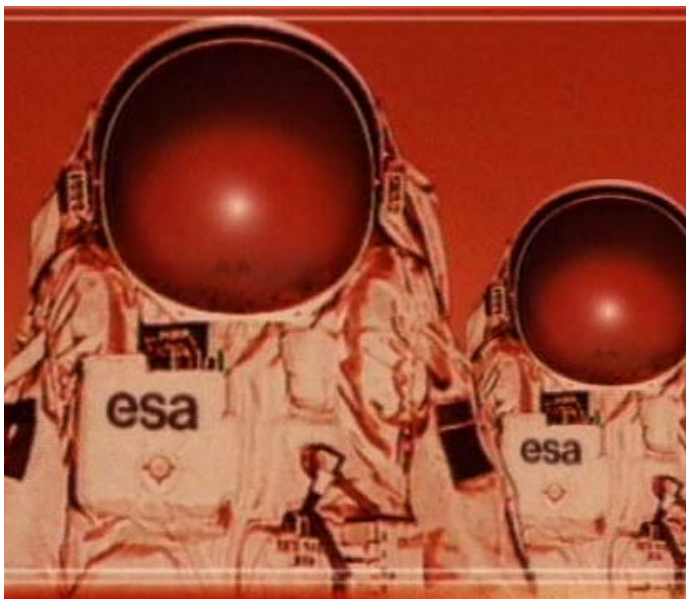
In the centre of the solar system is the gigantic hot ball of gas (mostly hydrogen) - the Sun. A process called nuclear fusion generates heat and light at its centre, where temperatures can reach 14,000,000 °C! Its diameter is 1,392,000km compared to Earths with is only 12,756 km. More than a million Earths could fit in the Sun.

There are 8 major planets which orbit the Sun. The planets are commonly divided into two groups: the inner planets (Mercury, Venus, Earth, and Mars) and the outer planets (Jupiter, Saturn, Uranus, and Neptune). The inner planets are small and are composed primarily of rock and iron. The outer planets are much larger and consist mainly of hydrogen, helium, and ice.

Our moon

Since the earliest of times, mankind has always held a fascination for the moon. The moon was at the centre of many belief systems, with the ancient Greeks associating it with a goddess called, Artemis. Mesopotamians also believed that the moon represented a charging bull. Throughout the Middle Ages a commonly held belief was the moon was made out of green cheese.

Scientific knowledge about the moon grew with the invention of the telescope. Galileo Galilei was the first to study the moon with a telescope in 1609.



His observations, through the telescope, revealed a wealth of detail of the lunar surface.

Earth's Moon is now known to be a slightly egg-shaped ball composed mostly of rock and metal. It has no liquid water, virtually no atmosphere, and is lifeless. As there is no atmosphere, meteorites do not burn up like on earth, and form craters on the moon on impact. The temperature on the moon vary between 107 degrees during the day to -153 degrees at night. The moon's diameter is about 3,500 km, a quarter that of earth. The moon orbits around the earth approximately once 27 days; this period is referred to a lunar month. The force of gravity, (a force of attraction between two bodies), of the moon on earth is strong enough that oceans are pulled towards the moon. The gravity of the moon is what causes high and low tides. On the side of the Earth facing the Moon, the Moon's stronger pull makes water flow toward it, causing a dome of water to rise on the Earth's surface directly below the Moon. On the side of the Earth facing away from the Moon, high tide will also result; this is caused by the moon "pulling the Earth away" from the water on that side.

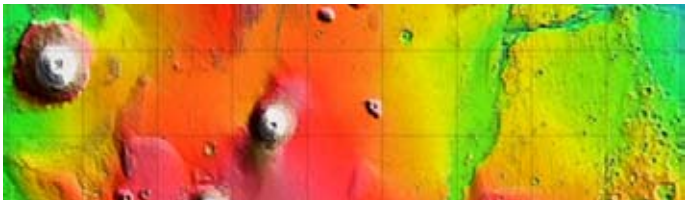
The Space Race - A history of space exploration

Throughout the 19th and first half of 20th century, powerful telescopes gave a comprehensive view of the geography of the visible side of the Moon. However with the advent of the Cold War, between The United States of America and the former Soviet Union, both nations wanted to affirm their power on the world stage, through space exploration.

On 4 October 1957, the Soviet Union successfully launched Sputnik 1, the first artificial satellite to orbit the Earth and the space race had begun. Rapid technological advancements in the development of rockets and satellites were made during this period, as both nations wanted to out compete each other. On the 12th of April 1961 the Soviet cosmonaut Yuri Gagarin became the first human in space when he entered orbit on the Vostok 1. Just 9 years later on the 16th of July 1969 United States launched Apollo 11 and sent the first man, Neil Armstrong, to walk on the moon, a moment of world wide celebration. The Apollo program consisted of five further manned landings on the moon. From these missions samples of rock and soil were returned to earth enhancing our knowledge of the moon.

Towards the future

The future of space exploration holds many possibilities. Recently NASA (North American Space Agency) announced plans to build a moon base by 2020. In the not to distant future there is even the possibility of space tourism, where travelling to space would be as easy as hoping onto a plane. The human race only knows and have only explored a tiny fraction of our backyard-space- however with technology progressing at such as fast rate the future of space travel has the potential to take humans to the far reaches of our universe.



Questions - True or false

- The moon is bigger than earth
- The moon rotates around the earth once every 27 days.
- The gravity of the moon produces tides on earth
- There are 8 major planets in our solar system
- The first man to walk on the moon was Yuri Gagarin

Activities

Design and draw what you think a future moon colony or rocket would look like? What would you have to consider in your design?

You have to crew a space flight. Get into groups of 5 and give each person a role to fulfil. Think carefully about the role of each person on your flight. Discuss what you would bring a why. Think about where would you go in space and calculate how far that is.

Group projects

Get into small groups and build a model of our solar system. Use different materials to represent the size of planets.

Under the Sea

Cinequarium UK. 7mins
Producer and Director Mico Tatalovich
and
Symbiosis USA. 6mins
Producer and Director Lucy Marcus
and
The Windows of Life Belgium. 19mins
Producer and Director Danny Van Belle
and
Jellyfish: A lethal beauty Germany. 43mins
Producer and Director Florian Guthknecht
and
The Big Blue Australia. 55mins
Producer and Director Jeni Clevers

The Big Blue – The Blue Whale

The majestic blue whale is the largest animal ever to have lived on Earth, growing between 25 to 32 meters in length, about the size of a bus. Mature, blue whales can weigh more than 100 tons. Females are larger than males of the same age, the largest sometimes weighing as much as 150 tons.
Blue whales are mainly found in deep water along the edges of continental shelves and along ice packs. Three subspecies of blue whales have been identified by scientists, with are found in three geographic regions: a subspecies that lives in the Northern Hemisphere, a subspecies that lives mainly

in Antarctic waters, and a subspecies sometimes called the “pygmy blue whale” that lives in a zone in the southern Indian Ocean and western South Pacific. Most populations of blue whales migrate extensively, travelling from the tropics or near tropics in winter to the edges of the pack ice in the northern and southern hemispheres in summer.

Blue whales feed by lunging open-mouthed into dense groups of small sea creatures such as krill, zooplankton, or fish. An adult blue whale can eat some 4 to 8 tons of krill per day. Blue whales commonly feed in Arctic and Antarctic waters during the summer, when krill is plentiful and found in large swarms. Blue whales may also feed on krill or plankton where there are upwellings of cold currents. The whales can live off stored blubber when they migrate into warmer regions where krill is less available.

A lethal beauty- The Jellyfish

The jellyfish can be found in every ocean in the world and even in some fresh water bodies. Jellyfish lack basic sensory organs and a brain, but their nervous systems allow them to perceive stimuli, such as light and odor, and respond quickly. They feed on small fish and zooplankton that become caught in their tentacles. Most jellyfish are passive drifters and slow swimmers.

The box jellyfish is one of the most well known of all types of jellyfish, infamous for its venomous sting, used to instantly stun or kill prey, like fish and shrimp. Their venom is considered to be among the most deadly in the world, containing toxins that attack the heart, nervous system, and skin cells. Box jellies, also called sea wasps and marine stingers, live primarily in coastal waters off Northern Australia and throughout the Indo-Pacific. They are pale blue and transparent in colour and get their name from the cube-like shape of their bell. Up to 15 tentacles grow from each corner of the bell and can reach 10 feet (3 meters) in length.

Symbiosis- Relationships underwater

The term symbiosis commonly describes close and often long-term interactions that are beneficial to all biological species involved. Symbiotic relationships are important in nature and ensure the health and survival of many species.

An example of a symbiotic relationship is goby species living together with burrowing shrimps. The shrimp maintains a burrow in the sand in which both the shrimp and the goby fish live. The shrimp has poor eyesight compared to the goby, but if it sees or feels the goby suddenly swim into the burrow, it will follow. The goby and shrimp keep in contact with each other, the shrimp using its antennae, and the goby flicking the shrimp with its tail when alarmed. These gobies are thus sometimes known as watch-man, or prawn gobies. Each party gains from this relationship: the shrimp gets a warning of approaching danger, and the goby gets a safe home and a place to lay its eggs.

Another example of a symbiotic relationship is between fish and the cleaner shrimps. It has been observed that fish with parasites may come to “cleaning stations” in the reef. Certain species of fish and several types of cleaner shrimp may as-sist the fish in large numbers and even go inside the mouth (and then to the gill cavity) without being eaten. The cleaning shrimps benefit from getting food, while the fish is cleaned.

Activities

Learn and spell the words

symbiosis zooplankton tentacles fertilization continental species Arctic Antarctic nervous interactions parasties blubber

Individual Projects

Make a diorama depicting the sea, using the species we have learned about in the films

Imagine you are a jellyfish living on Australia’s Great Barrier Reef (remember FINDING NEMO is set on the Great Barrier Reef) - write a story about your day. What species would you encounter?

What is a food chain? Make a poster about the food chain on the Great Barrier Reef.

Questions

- The oceans cover ____% of the earth’s surface area and contain ____% of all the surface water on the planet.
- How do the oceans protect the earth?
- How do the oceans provide both food and oxygen for mankind?
- What are some of the sources of power in the ocean?
- How might life on earth be different if the oceans were larger or smaller than they are now?

Further Reading and Resources

http://whales.magna.com.au/

Greenpeace - http://www.greenpeace.org/

Killer Whale Museum
http://www.acr.net.au/~kwmuseum/

http://whales7.tripod.com/policies/old_tom.html

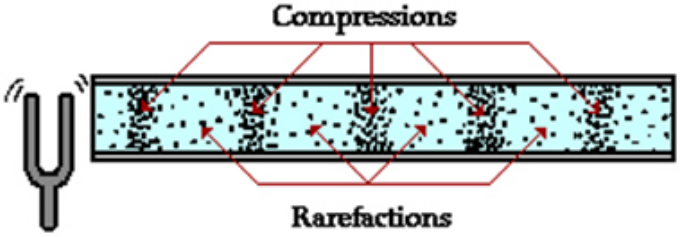
Making Sense of the World

Seeing-Feeling Germany. 3mins
Producer and Director H U Danzebrink
and
The Colour of Sound UK. 55mins
Producer Karen Smyth Director Vince Hunter
and
Thunderheads Australia. 55mins
Producer and Director Klaus Toft

The Colour of Sound

Sound is all around us; it makes the world a more lively and exciting place to live. It enables us to communicate with each other and warns us of approaching danger. However, what is sound?

Sound is actually mechanical energy propagating through a medium as a compression/ longitudinal wave (waves that have backward and forward vibrations parallel to energy transfer). Soundwaves are mechanical waves, which means it needs particles to allow for the transmission of energy and cannot travel through the vacuum of space.
Sound waves are created by vibrations, which causes pressure fluctuations in the surrounding matter. The waves are transmitted through a medium by collisions of particles, caused by the pressure changes, in a refraction and compression pattern. In rarefaction, particles are spread out with the decrease in air pressure and in compression, when pressure increases, particles are pressed together. (Pictured below)



Motion of Soundwaves

Like all waves, soundwaves are characterised by its wavelength, frequency, amplitude, and velocity.

Wavelength of soundwaves and of all compression waves is the measurement of the distance between two maximum compressions. Wavelength corresponds with frequency; soundwaves that have shorter wavelengths have higher frequencies.

Frequency is a calculation of how many waves pass a point per second. Frequency is measured in Hertz (Hz). 1 Hz is equivalent to 1 vibration per second. Frequency is associated with pitch, the higher the frequency the higher the pitch (higher sound). Humans can hear sound frequencies between 20Hz to 20,000Hz. Frequencies below human audible range are called infrasound and frequencies above 20,000Hz are called ultrasounds.

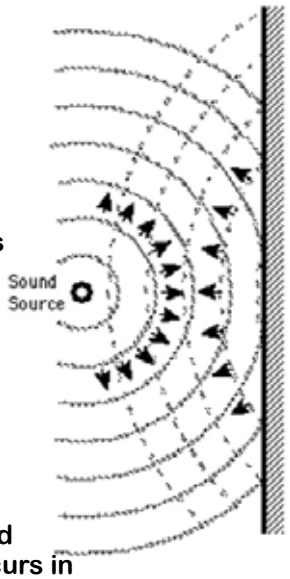
Amplitude describes the compression of a soundwave through the intensity/ loudness of sound. The higher the amplitude of a soundwave the more particles are at its crest during compressions and the louder a sound is. Amplitude/ loudness of sound is measured in decibels.

Velocity (speed) of sound is the rate at which the pressure disturbance, a sound wave makes, passes through a medium. The speed of a sound wave depends on the properties and state of the medium it is propagating through. Soundwaves travel faster in matter with strong particle-particle interaction, such as in the states of solids and liquids than in gas. The speed of sound in air depends mainly on temperature, the higher the temperature the faster the speed of sound is (effecting the strength of molecular interactions). Speed travels at approximately 343 meters per second at room temperature (20 degrees Celsius).

Acoustics – the Study of Sound

Acoustics is the science of sound and how it affects humans along with the environment. It is the oldest branch of physics and has its origin 2500 years ago.

Reflection of Sound



The reflection of sound occurs when a soundwave strikes a boundary in its path (shown in the diagram). The reflection of sound follows the law of reflection, like any other wave, that is, the angle of reflection is equal to the angle of incidence (incoming wave). When sound is reflected two phenomenon may occur, a reverberation or an echo depending on the circumstances.

A reverberation is a prolong perception of sound caused by multiple reception of a reflected noise within 0.1 seconds. It occurs in confined spaces of dimensions 17 meters or less. This is because in a room with dimensions of 17 meters it takes approximately 0.1 seconds for sound to travel and be reflected back to the source. Your brain can store a memory of sound for about 0.1 second so when a person hears a reflected sound within 0.1 second it will seem to be a prolonged.

The other phenomenon reflected sound can led to is the echo. An echo is reflected sound received more than 0.1 seconds after the original noise was made. After 0.1 seconds, the memory of the first sound has faded and when the reflection is heard, it gives a perception of two sounds.

Individual project

From the list below, choose a person or invention and create a poster that explains why they were important to our understanding of sound

Alexander Graham Bell
Emile Berliner
Thomas A. Edison
Hermann Helmholtz
Ernst Mach

Thunderheads- understanding the thunderstorm

The film follows a team of meteorologists as well as pilots from the USA, UK, Russia and Australia, researching and understand the thunderstorm. They are ready to put there lives on the line to reveal the link between thunderstorms and global warming.

Life Cycle of a Thunderstorm

All thunderstorms, go through three stages of development: the cumulus stage, the mature stage, and the dissipation stage. Depending on the conditions present in the atmosphere, these three stages can take anywhere from 20 minutes to several hours to occur.

Cumulus stage

Thunderstorms form when the air close to the ground is warm and humid and begins to rise within cooler surrounding air. A variety of conditions can cause the lifting needed to initiate these clouds, including the heating of the ground, wind blowing up and over a mountain, sea breezes, cold fronts, and tropical low-pressure systems. The greater the temperature difference between the relatively warm cloud and its surrounding air, the more vigorous the thunderstorm will be. When warm air lifts, it becomes cooler. The moisture in the air rapidly condenses into super-cooled liquid drops of water, which appears as cumulus clouds. As the water vapor condenses into liquid, heat is released which warms the air, causing it to become less dense than the surrounding dry air. The cloud is now warmer as well as less dense than the surrounding unsaturated (cloudless) air, causing the cloud to rise. This causes the cloud to accelerate upward in the form of turbulent bubbles, giving the cloud its characteristic cumulus shape.

Mature stage

At the very top of a thunderstorm there is a region known as the anvil. This is where the thunderstorm cannot reach anymore height in the atmosphere due to the stratosphere being stable so the cloud can only spread out. The dust and other matter which gets sucked into the thunderstorm when it is growing comes in contact with the supercooled water droplet at this point, and immediately turns into ice. As the ice particles fall they melt to become rain. If the updraft is strong enough, the droplets are held aloft long enough to be so large that they do not melt completely and fall as hail. While updrafts of warm air are still present, the falling rain creates downdrafts as well. The presence of both updrafts and downdrafts causes turbulence within the storm system which, inturn cause lightning and strong winds.

Dissipating stage

If the downdrafts within the storm cell are stronger, this descending cold air will cut the inflow of warm moist air into the thunderstorm. Once the updraft of warm air feeding the storm is stopped the storm system dissipates.

Questions

Learn and spell the different types of clouds:

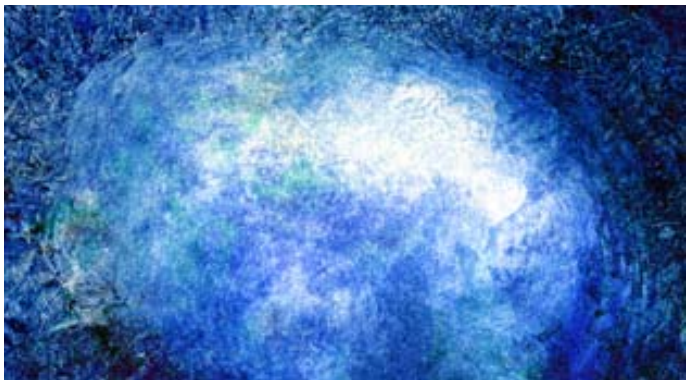
Stratus Altostratus Cirrus
Cirrocumulus Cumulus Stratocumulus
Cumulonimbus

Activities

Look up the different layers of the atmosphere.

Look up where the different clouds are found in the atmosphere.

Discuss how global warming will increase the prospect of more extreme thunderstorms?



Animal Kingdom

I use the word 'State' Australia. 7mins
Producer and Director Grayson Cooke
and
Echidnarama Australia. 15mins
Producer and Director Matthew Higgins
and
A Wild Beetle Chase USA. 13mins
Producer and Director Sarah Jackson
and
The Wilds of Tasmania Australia. 44mins
Producer Brett Shorthouse Director Brett Shorthouse and Jasper Montana

The Echidna

Echidnas are egg-laying mammals found in Australia, Tasmania, and New Guinea that eat and breathe through a bald, tubular beak protruding from a dome-shaped body covered in spines.

Echidnas can be active day or night, probing along the ground slowly and deliberately as they search for prey, but they will shelter themselves from extreme midday heat in burrows or caves. Like their relative the platypus, echidnas have an unusually low but variable body temperature and cannot tolerate more extreme heat. In spite of echidnas' outward resemblance to hedgehogs, the two animals are not related and belong to separate mammalian orders.

Echidnas are very long-lived; one echidna was recorded at 45 years of age in the wild, and one captive individual was well over 50 years old at the time of its death.

The Tasmanian Wedge-Tailed Eagle

The wedge -tailed eagle is found in a wide variety of habitats. It is almost black when mature, has feathered legs and a long wedge-shaped tail. It is a massive bird which can weigh up to 5 kg, with a wing span of up to 2.2 m or just over 7 feet.

They use very traditional nests almost always in very large eucalypts sheltered from the wind. They are very shy nesters and will often desert their nests if disturbed by land clearing, particularly early on in the breeding season, which is August to January. Breeding eagles need over 10 ha of surrounding forest especially uphill of a nest tree.

The Tasmanian wedge-tailed eagles have been isolated for 10 000 years from their mainland counterparts and have become a separate subspecies.

With only about 130 pairs successfully breeding each year in Tasmania, the wedge-tailed eagle is listed as endangered. The major threats to the species include habitat loss, nest disturbance, collisions and electrocutions with powerlines and persecution through shooting, trapping and poisoning by thoughtless persons.

Spelling

Echidna	mammal	tubular
protrude	monotreme	temperature
mature	subspecies	

Individual activities

A biography is an account of the life of a person, an animal or a thing. The four films in this program examine particular species - choose one of the species and research your animal. Use this research to create a biography of a particular animal, from birth to death. Where does it live? Does it remain close to its family? Does it have a mate? How does it raise its children, if at all? You can present your biography as a poster, as a short story, or you could make a short film.

Further reading

Parks and Wildlife Tasmania
http://www1.parks.tas.gov.au/wildlife/birds/wteagle.html

Encyclopaedia Britannica
http://www.britannica.com/EBchecked/topic/177880/

Study Guide written by Sebastien Tong and Tijana Stefanovic as part of the CSIRO's Student Research Scheme

SCINEMA

The best and brightest science films can be seen in every corner of Australia this coming National Science Week as SCINEMA, Australia's premier festival of science film, tours to over 150 towns and cities from August 16 to 24.

SCINEMA, a science film, video and multimedia festival, brings a program of science drama, documentaries, and short subjects, as well as a number of guest speakers, to venues from Cairns to Hobart, and Sydney to Perth.

Since its launch in 2000, SCINEMA has played to tens of thousands of people across Australia, and in 2008, our team has curated a program of amazing films on topics ranging from climate change, human health and natural history, to broader social films. SCINEMA gives many filmmakers an opportunity to have their films, sometimes obscure but always terrific, be seen by an audience.

SCINEMA (pronounced with a long 'i' to emphasise the science behind the cinema) is a partnership of the CSIRO, Cosmos Magazine and the National Museum of Australia, with funding from DEST's National Science Week program, and ACT Department of Health. (Media release issued 10 March 2008).

Promoting and raising the public level of science literacy is the major driver behind the team who run SCINEMA. We have, for eight years, provided a vehicle for new local talent to have their work screened to a national audience and gain experience and recognition, and we continue this year, screening a program of student films at Canberra's Discovery Centre.

SCINEMA thanks our kind sponsors:

In addition to the film screenings, our line-up will

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