Earth Revealed VIDEO #PROGRAM 13: Volcanism

DIRECTIONS: CLICK ON THE FOLLOWING WEBSITE LINK LISTED BELOW AND Locate VIDEO 13 and CLICK on the VOD button to start the video

http://www.learner.org/resources/series78.html

0:00-1:29 Images • Animation

Images of lava pools and various eruptions of **1.** on Earth are shown. Ancient theories of the origin of volcanism are presented. Animation is used to show the *Voyager* spacecraft's look at volcanism on **2.** a moon of Jupiter. Images of evidence of volcanism on Venus and Mars are shown. Comparison is made between volcanism on other worlds to volcanism on Earth. Volcanic gases have contributed to the **3.** of Venus, Mars, and Earth. They have also produced water for streams and oceans.

1:30-3:00 Remarks by series host

Volcanoes serve as clues about what is going on inside Earth. Volcanoes are proof that Earth's interior is hot—hot enough to melt rock-forming **4.** The different types of eruptions are described. Some eruptions throw **5.** into the atmosphere that can stay aloft for days and travel thousands of kilometers before settling back to Earth's surface. Sometimes the dust can remain in Earth's atmosphere for months, blocking out sunlight and affecting global weather. Volcanoes are found in a wide variety of geologic environments.

A. Atmospheres	**B. Io**	**C. Magma**	**D. Volcanic ash**	**E. Volcanoes**

3:01-6:00 Images • Interview with Robert Tilling, U.S. Geological Survey

Most undersea volcanoes form along **6.** plate boundaries**.** Runny basaltic lava pours through fissures, cooling in the water forming pillow lava. Images show the Hawaiian Island chain volcanoes that are believed to have formed over a **7.** **,** an area of melting deep inside the mantle. As the Pacific Plate moves over the hot spot, islands form and move off of the hot spot, allowing new volcanoes to form. The movement of the Pacific Plate is described as the cause of the **8.** volcanic chain. The chain of Hawaiian Islands shows an age progression moving from the southeast (youngest) to the northwest (older). Hot spot volcanoes extrude very hot, low viscosity lava, forming very broad **9.** **.** Volcanoes erupt from fissure**s,** in areas known as **10** **,** as well as from the crater**.** This is caused by a combination of gravitational forces and pressure from the magma inside the volcano.

A. Divergent	**B. Hawaiian Island**	**C. Hot spot**	**D. Rift zones**	**E. Shield volcanoes**

Earth Revealed VIDEO #PROGRAM 13: Volcanism

6:01-7:55 Animation • Images • Remarks by series host

Animation is used to show Earth in space with major plate boundaries lit as if magma were extruding from them. The major plate boundaries are shown and related to volcanism. Images are used to show how

11 boundaries**,** in particular, are related to explosive **12** **.** Gases are shown escaping through fissures. Water vapor, carbon dioxide, sulfur, and nitrogen are the most common gases given off by volcanoes. They are also found in the atmosphere and in Earth's oceans. Evidence of volcanic gas is also found locked within hardened lava. While images of a lava field are shown, a discussion describing basaltic lava as being the main type of lava associated with shield volcanoes is presented. Holes in the basaltic rock called **13** are shown. These vesicles are produced in lava as pressure suddenly decreases causing bubbles of gas to spontaneously form in the lava. An analogy involving the gas released when a bottle of soda is opened is included. Along with gas content, the explosiveness of an eruption is affected by the magma's temperature and chemical composition. The different types of magma are compared as to composition, temperature, and viscosity.

7:56-10:13 Remarks by series host • Images

The explosiveness of composite volcanoes is explained by the high silica content of andesitic lavas of which these volcanoes are made. The properties of andesitic lava are presented as they relate to type of eruption produced. **14** of a magma is related to the amount of gas trapped in the magma. Again a bottle of soda is used as an analogy to an explosive volcanic eruption. The bottle is shaken and then opened to demonstrate how trapped gases can be very explosive whenever the force holding the gas in is released. The formation of

15 is described and its low density, caused by the many air pockets contained, is demonstrated by floating a piece in water. The manner in which the type of lava produced is related to viscosity is presented. The words ***pahoehoe*** and ***aa***, used by Hawaiians to describe lavas produced by differing viscosities, are defined. Lava tubes**,** caused by active pahoehoe flows, are shown as one cause for the shape and size of shield volcanoes.

A. Composite volcanoes	**B. Convergent**	**C. Pumice**	**D. Vesicles**	**E. Viscosity**

Earth Revealed VIDEO #PROGRAM 13: Volcanism

10:14-11:07 Images • Remarks by series host

Images of Mount Saint Helens and other explosive volcanic eruptions are shown. These are described as building steep cones since the lava they extrude is much more viscous and does not flow very far and because explosive debris piles up around the volcanic vent. Some volcanic cones, called **16** , are made up entirely of fragments or cinders. An overall comparison is made among cinder cones, composite volcanoes, and shield volcanoes. Cinders that compose the flanks of cinder cones indicate that this type of volcano is less explosive than composite volcanoes.

11:08-12:38 Interviews with Robert Tilling; Richard Hazlett, Pomona College

Although most volcanoes are associated with convergent and divergent plate boundaries or else with well-established hot spots, there are some exceptions where volcanoes have formed far from any of these. Amboy Crater found in the southeastern California desert has formed 700 km from the nearest convergent boundary and 200 to 300 km from the nearest divergent boundary. It has not formed over a hot spot yet it is a young cinder cone that has been active within the last few thousand years. It has formed because of extensional forces stretching and thinning the crust. This allows **17** to open up and magma to be forced upward, breaking through the crust.

12:39-14:23 Remarks by series host (with images)

Although belts of volcanoes have grown, shifted, and died with changes in plate boundaries, the history of individual volcanoes can be quite diverse and complex. The original gas-charged eruptions of Panum Crater produced a shallow crater surrounded by a rim of pumice. The remaining magma, having lost most of its gases, rose slowly but of the vent during the next eruption. The magma plugged the vent, forming a dome composed of volcanic glass: **18..** ı.. The composition and viscosity of magma that forms obsidian is described. Volcanic **19..** usually form in the aftermath of massive explosions of composite volcanoes, such as Mount Saint Helens in 1980. Images of Mount Saint Helens are shown while lava domes and **20** are described. Images are used to show damage done by volcanic activity.

A. Lava domes	**B. Obsidian**	**C. Cinder Cones**	**D. Nuee Ardente**	**E. Fractures**

Earth Revealed VIDEO #PROGRAM 13: Volcanism

14:24-25:07 Interviews with Robert Tilling; John Eichelberger, Sandia National Labs; Thomas Redfield, Andrew Goodliffe, University of Alaska (with animation and images)

Volcanic activity is usually preceded or accompanied by changes in the chemical and physical characteristics of the volcano. Two major areas are studied when there is concern about the eruption of a volcano.

21 studies measure changes in the shape of the volcano and **22** indicates when magma that is moving toward the surface may be fracturing and moving overlying rock. Studies of this type hopefully will lead to successful volcano forecasting. Many volcanoes have destructive behavior and are just too dangerous to view from close by. Others erupt in areas too remote to be easily studied by geologists. The eruption of Katmai in Alaska in 1912 was one such eruption. Not until 1916 was an expedition able to reach the scene of the eruption. What they found was a valley full of gaseous steam vents or **23** . The summit of Katmai had collapsed because the magma had erupted at the base of Katmai. This eruption was named Nova Rupta. The study of Katmai is still of interest to geologists of today. Images show the difficulty involved with studying remote volcanoes and mention is made of environmental concerns that must be considered. Geophysicists try to map the underlying pattern of rocks in hopes of gaining insight into the workings of volcanic activity. Measurements taken that hopefully lead to this information include: studies of magnetic variations in the rocks, how heat escapes and the rocks cool, the electrical conductivity of rocks, and variations in the gravity field on and near the volcano. Images show fumaroles. Their relationship to ore deposits is discussed and scientists are shown studying fumaroles that have been exposed by erosion. This type of study should help in forecasting eruptions and lead to a better understanding of **24** systems**.**

25:08-end Remarks by series host

Although volcanoes can be very dangerous and damaging to Earth, there are many benefits that we enjoy. Soils formed from weathered volcanic rocks are among the most fertile in the world. **25** energy from volcanic activity is used in many parts of the world. Volcanic activity recycles Earth's ocean basins and ancient volcanic eruptions are probably responsible for Earth's oceans and atmosphere.

A. **Geothermal**	B. **hydrothermal** s	C. **fumaroles.**	D. **seismic monitoring**	E. **Ground deformation**