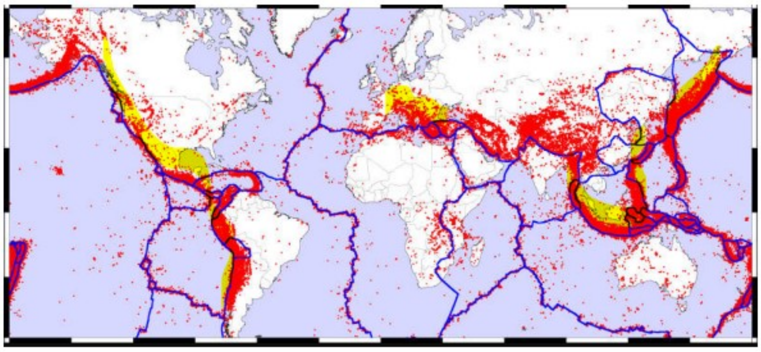
W5 Thursday 3: Geography - Earthquakes

27 January 2021 14:02

Where tectonic plates meet and move we often get earthquakes. We have already seen that some fault lines (where tectonic plates meet) are heavily populated (this means lots of people live there).

I have highlighted in yellow on the map below... the edge of North and South America, Japan, many Asian countries. So people continue to live on fault lines even though they know the danger of living there. The red dots are where there are earthquake activity.



Let's start by exploring these websites.

https://www.dkfindout.com/uk/earth/earthquakes/

https://www.bbc.co.uk/bitesize/topics/z849q6f/articles/zj89t39

People are always going to live on fault lines and amongst many things we need to do in order to live there safely, we also need to monitor earthquakes and adapt our buildings. We measure, watch and keep track of earthquakes using a machine called a seismometer which measures movement in the ground. We adapt our buildings by making them less likely to fall over when they get severely shaken. Earthquakes produce a lot of force that can rip solid buildings apart. New buildings are designed to gently wobble rather than crack and fall down. There is more information for you to read at the bottom of the page.

Pasta Challenge!

Mission Impossible theme song (Original) **Your task, should you choose to accept it, is to... build a structure using a maximum of one packet of (uncooked!) spaghetti and tape (marshmallows optional but allowed) that can withstand:**

A) the weight of one tin (of beans, soup etc) - please attach a photo.
B)a forceful wobble with the tin for 10 seconds. - video or picture to indicate successful structure or collapsed pile of spaghetti.

(Extra points for height)

Video to give you some tips on your structure!

W5 Thursday 2...

Intensity and magnitude

HOW DO YOU MEASURE THE SIZE of an earthquake? News reports usually give the quake a magnitude on the Richter scale. The Richter magnitude is useful because it can be worked out from a recording – called a seismogram – of the earthquake waves (pp.52–55). The waves of a big quake can be recorded on the other side of the globe. So as long as the distance between the recording device and the quake's centre is taken into account, the Richter magnitude can be calculated from anywhere on the planet. But where the shaking is felt, it is more important to know how intense the shaking was and how it affected buildings and people. This is called the intensity of shaking. It is measured on a different scale such as the Modified Mercalli Intensity Scale. Intensity is purely descriptive and cannot be recorded by a machine. Instead it is compiled by inspecting the damage and getting the quake's survivors to fill in questionnaires. Every earthquake has just one Richter magnitude. But because the damage it does falls off away from its centre, it has many intensities, which also fall off away from the centre.

Giuseppe Mercalli (1850–1914)

Intensity

The Italian volcanologist Giuseppe Mercalli created his intensity scale in 1902. He used 12 grades with Roman numerals from I to XII. His scale was later updated to create the Modified Mercalli Intensity Scale.

I The shaking is not felt by people, but instruments record it.

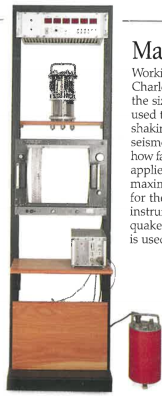
II People at rest notice the shaking (above), especially if they are on the upper floors of buildings. Delicately suspended objects may swing.

III People indoors feel a vibration like the passing of a light truck. Hanging objects swing (above). Length of shaking can be estimated, but people may not recognise it as an earthquake.

IV Vibration like a heavy truck passing. Dishes rattle and wooden walls creak. Standing cars rock.

V Felt outdoors. Liquid in glasses slops out (above), small objects knocked over. Doors swing open and close.

VI Felt by all. Many are frightened and rush outdoors. People walk unsteadily; windows, dishes break (above). Pictures fall off walls; small bells ring.

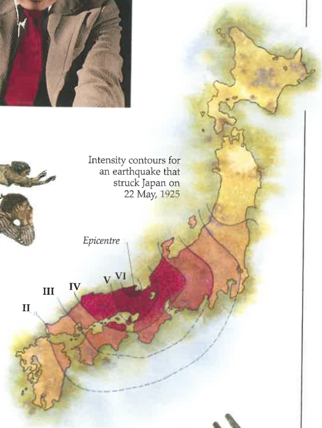


RECORDING THE SHAKES
Richter took the smallest earthquake he could record at the time and called it magnitude zero. Today's instruments are much more sensitive, so the smallest quakes they register are given negative magnitudes. The highest Richter magnitudes recorded are about 9.

Magnitude

Working in California in the 1930s, Charles Richter wanted to compare the sizes of local earthquakes. He used the wiggly tracings of the shaking which are recorded on seismographs (pp.52–55). Knowing how far he was from each quake, he applied a distance factor to the maximum wiggle. After allowing for the characteristics of the instrument, he came up with the quake's magnitude. Richter's scale is used today all over the world.

American seismologist Charles F. Richter (1900–1985)



Intensity contours for an earthquake that struck Japan on 22 May, 1925

VII Difficult to stand (above). Furniture broken, plaster and loose bricks crack and fall. Waves on ponds. Large bells ring.

VIII Steering of cars affected. Damage to masonry walls, some of which fall. Falling chimneys, steeples (above), monuments. Branches off trees. Changes in flow of wells and springs. Cracks in wet ground.

IX General panic. Animals run to and fro in confusion. General damage to foundations of buildings. Frame buildings, if not bolted down, shifted off their foundations (above). Sand, mud, and water bubble out of ground.

X Most masonry and frame buildings destroyed with their foundations (above). Some well-built wooden buildings destroyed. Large landslides. Water thrown out of rivers and canals.

XI Railway lines greatly distorted. Underground pipelines completely out of service. Highways useless. Ground distorted by large cracks. Many large landslips and rock falls.

XII Practically all built structures above and below ground destroyed or useless (above). Ground surface much altered with cracks and slumps. River courses moved, waterfalls appear. Waves seen on ground surface.

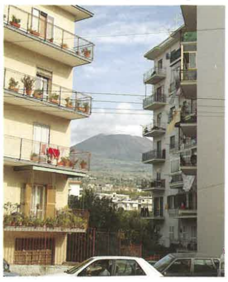
W5
Thursday 2...

Preparing for disaster

Italian magazines produced for the 1990s, the International Decade for Natural Disaster Reduction

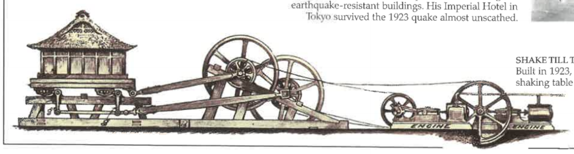
EARTHQUAKES AND VOLCANIC ERUPTIONS are natural events that have been happening throughout the Earth's history. As the planet's population increases, more and more people are living in danger zones, along faults or close to active volcanoes. When one of these natural events upsets human life, many people may die and their buildings and farmland may be destroyed. In the aftermath, disease and famine may be even more destructive. We cannot hope to stop disasters entirely. But as knowledge of the Earth's workings increases, wise planning can reduce their number and scale. Learning to live in disaster zones means actively monitoring volcanoes and fault lines and building cities that can withstand earthquake shaking. It also means education, so people know what to do in an emergency.

BUILDING CITIES THAT WON'T FALL DOWN
Many modern cities are in earthquake-prone regions. One way to reduce disaster is to design buildings that can withstand the deadly shaking. The Transamerica Pyramid looks precarious, but it is designed to be twice as strong as building codes for the San Francisco Bay area require. In a major quake, the structures at the base will reduce sway by a third.



LIVING IN THE SHADOW
Two thousand years after the volcano's greatest eruption, over two million people now live in the Bay of Naples in the shadow of Mount Vesuvius. This is modern Herculaneum, a thriving town that surrounds the ruins of Roman Herculaneum.

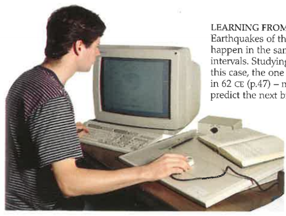
FRANK LLOYD WRIGHT
This American architect was a pioneer in the design of earthquake-resistant buildings. His Imperial Hotel in Tokyo survived the 1923 quake almost unscathed.



SHAKE TILL THEY DROP
Built in 1923, this pioneering Japanese shaking table was used to test models of buildings to see how they stood up to severe shaking. Modern shake tables are controlled by computers.

MOST MEASURED PLACE
The town of Parkfield in central California straddles the San Andreas fault system. Seismologists have predicted a major earthquake here. A laser measuring system is being used to detect movements along the fault. The laser, mounted on a hilltop in Parkfield, bounces light off a network of detectors several kilometres away on the other side of the fault. It can detect ground movement of less than a millimetre over six kilometres.

MEASURING CREEP
A technician for the US Geological Survey emerges from a creepmeter. He has been measuring creep, slow movement along the fault. Creep releases stress along the fault without detectable shaking.



LEARNING FROM PAST DISASTERS
Earthquakes of the same size tend to happen in the same place at regular intervals. Studying large quakes – in this case, the one that rocked Pompeii in 62 CE (p.47) – may help scientists to predict the next big tremor.

FALLING MASONRY
In this earthquake drill, rescue workers are treating actors "hit" by falling masonry. Many were injured by falling brick and stone in the 1989 San Francisco earthquake. Designing buildings without heavy architectural ornaments or chimneys might cut down on casualties like these.

Earthquake rescue practice in Japan

EARTHQUAKE DRILL
In Japan and California, earthquake drills are a part of everyday life. Children learn to keep a torch and good shoes by their beds, so they can get to safety even if a quake strikes at night. Many people rush outdoors, only to be hit by falling chimneys, roof tiles, or glass. The safest place indoors is under a solid piece of furniture like a table or beneath the frame of an archway or doorway.