Developing the Study of Earthquakes

In 1840 the British Association for the Advancement of Science resolved to set up a committee to study earthquakes. Much of the Committee's work involved devising and placing instruments to record the earthquakes. In the 1840s a number of instruments, mostly based on the pendulum principle, were placed in and around Comrie.

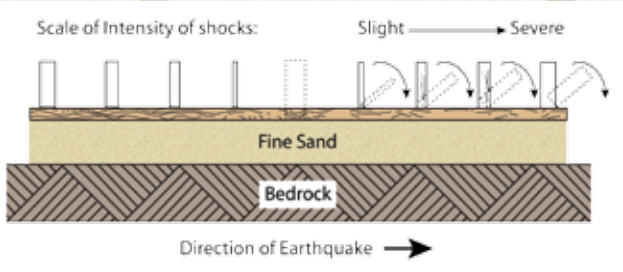
HP Horizontal Pendulum
CP Common Pendulum
IP Inverted Pendulum
UC Upright Cylinder
V Vertical Motion
M Mercury

Location and Types of Seismometers in Comrie

Members of the British Association's Committee were responsible for several important developments in the field of earthquake research. David Milne, chairman of the Committee, coined the word 'seismometer', and it is from this that other 'seismo-' words, including 'seismology' itself, are derived.

The word was applied to an instrument designed by Professor JD Forbes, the first ever designed on the principle of the inverted pendulum. This instrument was designed to measure the sideways movement of the ground resulting from an earthquake. It consisted of an inverted pendulum secured to a base and operated on the principle that the pendulum would be moved off its centre as the result of an earthquake's movement. As the pendulum vibrated, its movements were recorded by a pencil on a concave disc, which had concentric circles marked on it to indicate the strength of a shock, and the points of the compass to indicate its direction. Milne also collected data on how strongly the larger Comrie earthquakes were felt in different places in Scotland; data that is useful even today for studying British earthquakes.

The Seismoscope



Upright Cylinder Seismoscope

A different approach was tried in the 1870s, based on upright wooden 'skittles'. These boxwood cylinders were all of the same height but of different diameters so that they had various degrees of stability. It was expected that the size of the quake would relate to the size of cylinder overthrown, and that the quake's direction would be shown by the way in which the cylinders fell, and were 'recorded' in the sand. Unfortunately the earthquake activity again subsided, and the instrument never functioned. By around 1900 the building, which had become known as "Earthquake House", fell into disrepair and no evidence of the original seismoscope remained, except for some of the sand bed on the floor.

Earthquake House is a listed building and was initially restored in 1986. It has been refurbished by Perth and Kinross Council in partnership with Perth and Kinross Heritage Trust and the British Geological Survey (NERC). A model of the original seismoscope has been placed in the building and for contrast a modern recording seismograph has been installed by the British Geological Survey.

The Custodian of the building lives nearby and changes the recording paper on a weekly basis.

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Earthquake House

The 'Comrie Pioneers' and the Early Study of Earthquakes

The Earthquake House is located in The Ross, one of three settlements which make up the Perthshire village of Comrie. It was built in 1874 to provide a location for a seismoscope – a device used to register earthquakes. The one placed in this building replaced various other designs of instrument that had been used around Comrie since 1840 to try and record the earthquakes that occur in this area.

The Comrie Earthquakes

It was only during the latter part of the nineteenth century that scientists realised that the cause of earthquakes was the movement of rocks along fractures in the earth's surface (the crust), known as faults. There had been many previous theories, with some even suggesting that earthquakes were a meteorological phenomenon, similar to thunder.

Location of Earthquake House

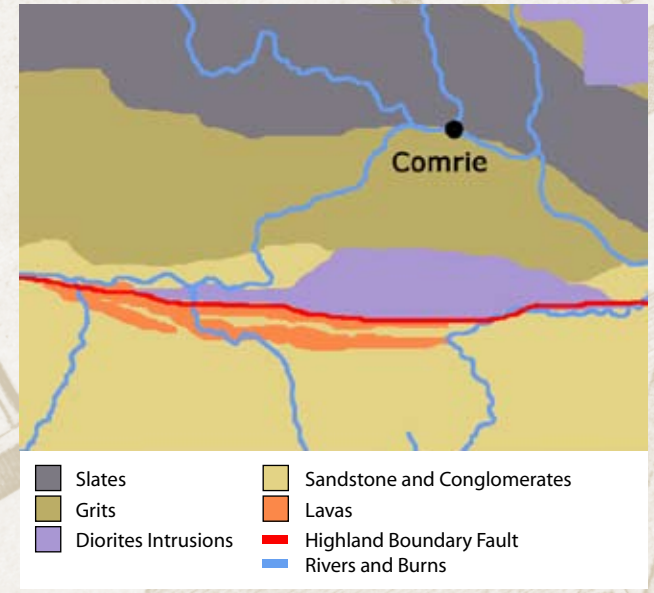
Today we know not only that faults are responsible for causing earthquakes, but why. The earth's crust is broken into a number of segments, called plates. The semi-molten interior of the planet causes these plates to move. Where plates collide, frequent destructive earthquakes are the result, such as those in California and Japan.

Although Britain is not on the edge of a plate, it contains a number of ancient faults along which less frequent earthquakes may be caused as a result of the pressure from other plates.

Comrie Earthquakes and The Highland Boundary Fault

Near to Comrie lies the great Highland Boundary Fault (HBF), a fault which was active nearly 400 million years ago. As the HBF is such a major geological feature, many writers have assumed that it must be responsible for the Comrie earthquakes, although the evidence suggests this is not necessarily the case. The HBF is visible on the ground surface about 2km south of Comrie, on the southern edge of the valley of the River Earn. The historical evidence suggests that the earthquakes had epicentres to the north, not the south, of Comrie.

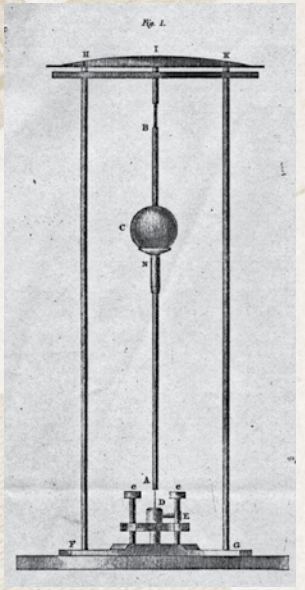
Typically British earthquakes occur at a depth of 5 - 15km underground, and it is difficult to tell what faults may be present at this depth by examining those visible on the surface. The HBF is a very complex structure comprising several smaller faults, and it may dip to the north underneath Comrie, and be responsible for the earthquakes. It is also possible, however, that there is another localised fault north of Comrie which is completely buried, and which is the true cause of the earthquakes.



Geology of Comrie Area

If this were the case, it would explain why similar earthquakes have not been observed elsewhere along the Highland Boundary Fault. Only detailed study of future Comrie earthquakes, made possible by modern seismometers such as the one you see in this observatory, can give us the answer to this question.

The Comrie Pioneers



Inverted Pendulum Seismometer

Two local ministers, the Rev. R Taylor and the Rev. S. Gilfillan, were the first to become interested in the phenomena when earthquakes were active in the Comrie area around the end of the 18th Century. The former wrote an account of the earthquakes which was sent to the Royal Society of Edinburgh, and the latter noted the times of occurrence of earthquakes in his journal for a period of thirty years.

After a period of inactivity, the earthquakes began again in 1839, when two more local residents became involved in their study.

The postmaster of Comrie, Peter Macfarlane, and a shoemaker in the village, James Drummond, both kept registers of the numerous shocks which followed the earthquake of 23rd October 1839. These early investigators of earthquake activity in the area became known as the 'Comrie Pioneers', as they were at the forefront of studying the local earthquakes.