

# THE FIRST SEISMOGRAPH IN ICELAND: A MAINKA-TYPE INSTRUMENT FIRST DEPLOYED IN 1909

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## **Abstract**

Modern seismology began in 1880 when John Milne (1850–1913) and other British scientists working in Japan began to study earthquakes and to develop horizontal and vertical pendulum seismographs. In Germany, the astronomer E. von Rebeur-Paschwitz (1861–1895) built sensitive horizontal pendulums for measuring tidal tilt. In 1889 he correlated his measurements with an earthquake in Japan, thus making the first teleseismic observation. Realising that, through international cooperation, teleseismic observations of earthquakes would allow the Earth's structure to be revealed he proposed a world-wide network of seismic stations and an international institute to collect the data.

The International Permanent Commission for Earthquake Research was founded in 1899 during the Seventh International Geographical Congress in Berlin. The Icelandic geographer Þorvaldur Thoroddsen (1855–1921) participated in the congress, becoming a member of the Permanent Commission. The first international conference on seismology was held in Strasbourg in 1901, followed by a second meeting in 1903. During the second conference, the remit of the International Seismological Association (ISA) was defined, including membership, the structure of the Permanent Commission, and the establishment of a central bureau in Strasbourg. The statute of the ISA included financial provision for the installation of seismographs in countries qualifying for ISA support. At both conferences it was argued that a seismograph should be established in Iceland, particularly in light of damaging earthquake activity in Iceland in 1896.

It was not until 1907 at the ISA conference in the Netherlands that Iceland, with the support of the Icelandic government, was granted an ISA seismograph. It became the first internationally supported seismic station. The seismograph was a 135 kg bifilar cone pendulum, made by C. Mainka (1873–1943) at the central bureau in Strasbourg between 1907 and 1908.

The instrument – shipped to Iceland in 1909 – was a mechanically recording horizontal seismograph with air damping and a static magnification of 40 to 75. The seismograph was installed at the School of Navigation in Reykjavík in late 1909, and it was positioned to record the north-south component. The installation was performed by state engineer Þorvald Krabbe (1876–1953) and clockmaker Magnús Benjamínsson (1853–1942). The

headmaster of the school, Páll Halldórsson (1870–1955), was responsible for running the seismograph. Seismograms from Iceland were sent to Strasbourg for analysis.

Another Mainka seismograph of the same design was installed in the same location around 1913 and was intended for east-west observations. Both seismographs remained in use until 1914, with later measurements made at the same site by the Icelandic Meteorological Office between 1925 and 1946. The instruments were then moved to IMO's office in Reykjavík in 1946. In 1954, the second seismograph was relocated to Akureyri and in 1955, the first seismograph was deployed to Vík in south-central Iceland to assist with seismic monitoring of the Katla volcano. It was replaced by the second instrument from Akureyri in 1964 and returned to Reykjavík, but its modern-day whereabouts are unknown. The second seismograph was decommissioned in 1974 and subsequently moved to the nearby Skógar museum, where it remains on display (Figure 1).



*Figure 1: Photograph of a Mainka 135 kg horizontal pendulum, the second seismograph in Iceland and now on display at the Skógar Museum in southern Iceland. The inset photograph shows the contact clock from ISA, now at Icelandic Meteorological Office, which was used to time the measurements.*