

## KOLA SUPERDEEP BOREHOLE

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The Kola Superdeep Borehole (Russian: Кольская сверхглубокая скважина) is the result of a scientific drilling project of the former USSR. The project attempted to drill as deep as possible into the Earth's crust. Drilling began on 24 May 1970 on the Kola Peninsula, using the *Uralmash-4E*, and later the *Uralmash-15000* series drilling rig. A number of boreholes were drilled by branching from a central hole. The deepest, SG-3, reached 12,262 meters in 1989.

The initial target depth was set at 15,000 m. On 6 June 1979, the world depth record held by the Bertha Rogers hole in Washita County, Oklahoma at 9,583 m was broken. After drilling to 12,066 m, a 5,000 m section of the drill string twisted off and was left in the hole. Drilling was later restarted from 7,000 m. The hole reached 12,262 m in 1989.

In that year the hole depth was expected to reach 13,500 m by the end of 1990 and 15,000 m by 1993. However, due to higher than expected temperatures at this depth and location, 180 °C instead of expected 100 °C, drilling deeper was deemed unfeasible and the drilling was stopped in 1992.

The Kola borehole penetrated about a third of the way through the Baltic continental crust, presumed to be around 35 kilometers, reaching rocks of Archaean at the bottom.

The stated areas of study were the deep structure of the Baltic Shield; seismic discontinuities and the thermal regime in the Earth's crust; the physical and chemical composition of the deep crust and the transition from upper to lower crust; lithospheric geophysics; and to create and develop technologies for deep geophysical study.

To scientists, one of the more fascinating findings to emerge from this well is that the change in seismic velocities was not found at a boundary marking Harold Jeffreys's hypothetical transition from granite to basalt. It was at the bottom of a layer of metamorphic rock that extended from about 5 to 10 kilometers beneath the surface.

The rock there had been thoroughly fractured and was saturated with water, which was surprising. This water, unlike surface water, must have come from deep-crust minerals and had been unable to reach the surface because of a layer of impermeable rock.

Another unexpected discovery was the large quantity of hydrogen gas, with the mud flowing out of the hole described as "boiling" with hydrogen.

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