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Virtual journey to centre of the Earth hints at planet's history

Experiments that seek to recreate conditions found deep inside the Earth are enabling new insights into the evolution of the planet.

Scientists have carried out laboratory studies of iron at very high temperatures and pressures, like those found in the Earth's core.

This is enabling them to better understand the history of Earth's magnetic field, which is driven by the behaviour of its outer core – a reservoir of churning liquid iron beneath the planet's rocky mantle.

Their experiments show that Earth's magnetic field – which protects life on its surface from harmful radiation from space – might have existed since the planet's formation. This would have accommodated the spread of primitive forms of life early in Earth's history.

Researchers at the University of Edinburgh used specialist equipment – known as a laser heated diamond anvil cell – to mimic conditions in the Earth's core. They examined how iron conducts heat at pressures up to 1.3 million times that of the atmosphere, and temperatures above 3000 Celsius.

They found that iron conducted relatively little heat at these conditions, which suggests that Earth's molten iron core has been cooling very slowly since its formation. This means that Earth has had a magnetic field from the very distant past, when the planet's interior conditions were much hotter than they are today.

Their findings agree with studies of old rocks that show Earth's magnetic field has existed for almost the entire age of the planet.

The study, published in *Nature*, was carried out in collaboration with the Carnegie Institution in Washington DC; the DESY Photon Science Laboratory in Hamburg; the Universidad de Los Andes in Bogotá; and the Chinese Academy of Sciences in Hefei.

Stewart McWilliams, of the University of Edinburgh's Centre for Science at Extreme Conditions, who took part in the study, said: "The magnetic field of Earth can only form under certain conditions, and until recently it was believed these might not have been present

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early in Earth's history. We now know that the magnetic field could have existed even in this early era.”

For further information, please contact:

Catriona Kelly, Press & PR Office, tel 0131 651 4401, email Catriona.Kelly@ed.ac.uk

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