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World's largest laser lends insight into giant planets of solar system

Experiments with the world's biggest laser are giving scientists fresh insights into the giant planets of our solar system and beyond.

A study of hydrogen at extreme temperatures and pressures has enabled researchers to build a clearer picture of conditions within Jupiter and Saturn – where hydrogen accounts for much of the mass.

The findings also shed light on the fundamental physical properties of the gas, which is the focus of research into a sustainable form of energy known as fusion.

An international team of researchers carried out sophisticated experiments using the most advanced laser in the world, the National Ignition Facility in California, US.

Powerful laser beams were fired across the stadium-sized facility towards a hydrogen sample, and optical sensors used to detect changes in the sample. Researchers were able to observe how hydrogen behaved as the pressure and temperature were raised to 6 million times that of Earth's atmosphere. Conditions were similar to pressures found in the interior of Jupiter.

Their observations helped pin down the physical conditions at which hydrogen begins to behave like a liquid metal. This elusive phase of the element has been little understood by scientists for many decades and has rarely been recreated in experiments.

The outcome gives scientists valuable insight into how hydrogen behaves at extreme conditions, such as those found on other planets.

The study, carried out by the University of Edinburgh with researchers in France and the US, was published in *Science* and supported by the Engineering and Physical Science Research Council.

Dr Stewart McWilliams, of the University of Edinburgh's School of Physics and Astronomy, who took part in the study, said: "Being able to undertake high-energy experiments using the world's biggest laser has afforded us valuable insights into one of the most important materials making up the planets of our universe, as well as future energy sources."

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