University calls on the maths of James Clerk Maxwell for new discovery

The University of Edinburgh has confirmed that the eminent scientist James Clerk Maxwell’s 160-year-old theories have helped in their recent light wave discovery.

Researchers have discovered a previously unknown type of light wave. They used equations developed by the renowned mathematician and physicist. These helped them to reveal how crystals can be manipulated to produce a distinctive form of light wave.

The phenomena – recently named Dyakonov-Voigt waves – could have a range of useful applications, such as improving biosensors used to screen blood samples or developing fibre optic circuits that transfer data more efficiently.

Scientists and engineers from the University of Edinburgh and Pennsylvania State University made the discovery by analysing how light – which travels in the form of waves – interacts with certain naturally occurring or man-made crystals.

They found that the waves are produced at a specific region (known as an interface) where the crystals meet another material, such as oil or water.

Researchers explained that these waves can be produced only using certain types of crystal whose optical properties depend on the direction in which light passes through them.

The team identified the waves' unique properties using mathematical models incorporating equations developed by James Clerk Maxwell. Since the mid-1800s, research on how light interacts with crystals has built on the work of Maxwell, who studied at the University of Edinburgh from the age of 16.

Dyakonov-Voigt waves, named after two leading scientists, diminish as they move away from the interface – a process called decay – and travel only in a single direction. Other types of so-called surface waves decay more quickly and travel in multiple directions.

The study, published in [Proceedings of the Royal Society A](), was funded by the Engineering and Physical Sciences Research Council and the US National Science Foundation.

Dr Tom Mackay, of the University of Edinburgh's School of Mathematics, who jointly led the study, said: "Dyakonov-Voigt waves represent a step forward in our understanding of how light interacts with complex materials, and offer opportunities for a range of technological advancements."