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News Release

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530m-year-old fossil has look of world's oldest eye, study suggests

A 530-million-year-old fossil contains what could be the oldest eye ever discovered, a study reveals.

The remains of an extinct sea creature include an early form of the eye seen in many of today's animals, including crabs, bees and dragonflies, researchers say.

Scientists made the finding while examining the well-preserved fossil of a hard-shelled species – called a trilobite. These ancestors of spiders and crabs lived in coastal waters during the Palaeozoic era, between 541-251 million years ago.

They found the ancient creature had a primitive form of compound eye – an optical organ that consists of arrays of tiny visual cells, called ommatidia, similar to those of present-day bees.

The team, which included a researcher from the University of Edinburgh, say their findings suggest that compound eyes have changed little over 500 million years.

The right eye of the fossil – which was unearthed in Estonia – was partly worn away, giving researchers a clear view inside the organ. This revealed details of the eye's structure and function, and how it differs from modern compound eyes.

The species had poor vision compared with many animals today, but it could identify predators and obstacles in its path, researchers say.

Its eye consists of approximately 100 ommatidia, which are situated relatively far apart compared to contemporary compound eyes, the team says.

Unlike modern compound eyes, the fossil's eye does not have a lens. This is likely because the primitive species – called *Schmidtellus reetae* – lacked parts of the shell needed for lens formation, the team says.

The team also revealed that only a few million years later, improved compound eyes with higher resolution developed in another trilobite species from the present-day Baltic region.

The study is published in the journal *Proceedings of the National Academy of Sciences*. It was carried out in collaboration with the University of Cologne, Germany, and Tallinn University of Technology, Estonia.

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Professor Euan Clarkson, of the University of Edinburgh's School of GeoSciences, said: "This exceptional fossil shows us how early animals saw the world around them hundreds of millions of years ago. Remarkably, it also reveals that the structure and function of compound eyes has barely changed in half a billion years."

Professor Brigitte Schoenemann, of the University of Cologne, said: "This may be the earliest example of an eye that it is possible to find. Older specimens in sediment layers below this fossil contain only traces of the original animals, which were too soft to be fossilised and have disintegrated over time."

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