

New fossils demonstrate that powerful eyes evolved in a twinkling (w/ video)

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A half-billion-year-old fossil compound eye, showing exquisite detail of the visual surface (the individual lenses can be seen as darker spots). Credit: Photo by John Paterson (University of New England).

Palaeontologists have uncovered half-a-billion-year-old fossils demonstrating that primitive animals had excellent vision.

An international team led by scientists from the South Australian Museum and the University of Adelaide found the exquisite fossils, which look like squashed eyes from a recently swatted fly.

This discovery will be published tomorrow in the journal *Nature*.

The lead author is Associate Professor Michael Lee from the South Australian Museum and the University of Adelaide's School of Earth & Environmental Sciences.

Compound Eyes

Modern insects and crustaceans have "compound eyes" consisting of hundreds or even thousands of separate lenses. They see their world as [pixels](#) – each lens produces a pixel of vision. More lenses mean more pixels and better visual resolution. (Each lens does *not* form a miniature image – a myth often perpetuated by Hollywood.)

Evolutionary Advantage

The fossil compound eyes were found on Kangaroo Island, South Australia and are 515 million years old. They have over 3000 lenses, making them more powerful than anything from that era, and probably belonged to an active predator that was capable of seeing in dim light.



The recently discovered fossil eyes would have seen the world with over 3000 pixels (center image), giving its owner a huge visual advantage over its contemporaries, which would have seen a very blurry world with about 100 pixels (left image). This is much better than the living horseshoe crab, which sees the world as 1,000 pixels, but not as good as living dragonflies, which have the best compound eyes and see the world as ~28,000 pixels (right image).

Credit: Image by Thierry Laperousaz (South Australian Museum) and Mike Lee (South Australian Museum/University of Adelaide).

Their discovery reveals that some of the earliest animals possessed very powerful vision; similar eyes are found in many living insects, such as robber flies. Sharp vision must therefore have evolved very rapidly, soon after the first predators appeared during the 'Cambrian Explosion' of life that began around 540 million years ago.

Given the tremendous adaptive advantage conferred by sharp vision for avoiding predators and locating food and shelter, there must have been tremendous evolutionary pressure to elaborate and refine visual organs.

Who owned them?

As the fossil eyes were found isolated, it's not certain what animal they came from, but they probably belonged to a large shrimp-like creature. The rocks containing the eyes also preserve a dazzling array of ancient marine creatures, many new to science. They include primitive trilobite-like creatures, armored worms, and large swimming predators with jointed feeding appendages.



The compound eyes of a living insect -- a predatory robber fly -- showing the individual lenses. Credit: Photo by Peter Hudson (South Australian Museum).

More pixels: more chance of survival

The recently discovered [fossil](#) eyes would have seen the world with over 3000 pixels, giving its owner a huge visual advantage over its contemporaries, which would have seen a very blurry world with about 100 pixels. This is much better than the living horseshoe crab, which sees the world as 1000 pixels, but not as good as living dragonflies, which have the best compound eyes and see the world as ~28 000 pixels.

Provided by University of Adelaide

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