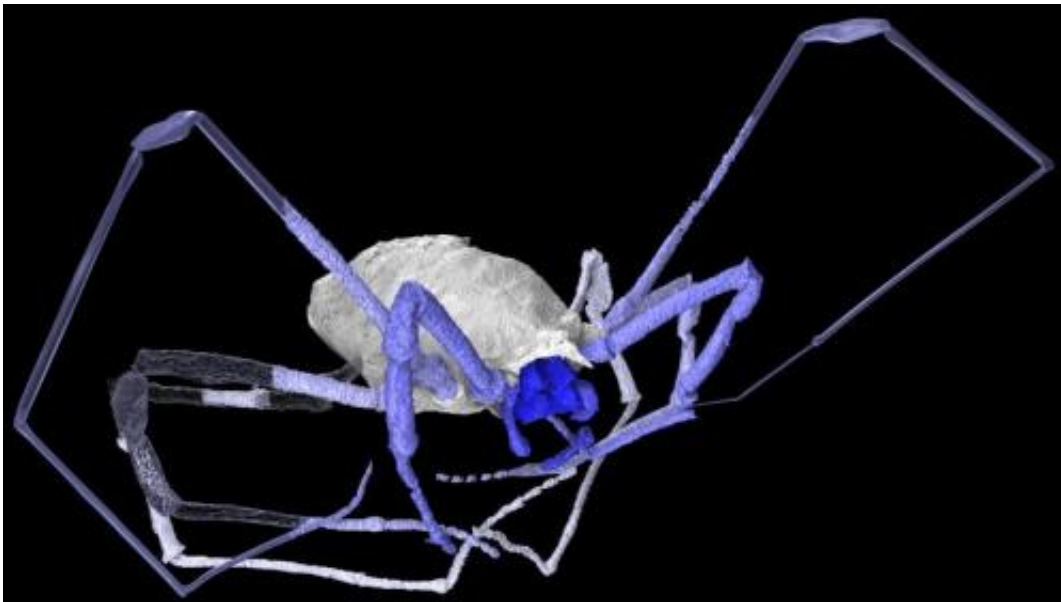


Ancient 'spider' images reveal eye-opening secrets (w/ video)

April 10 2014



This is the 305-million-year-old harvestman fossil. Credit: Paris NHM/Russell Garwood

Stunning images of a 305-million-year-old harvestman fossil reveal ancestors of the modern-day arachnids had two sets of eyes rather than one.

The researchers say their findings, published in the journal *Current Biology*, add significant detail to the evolutionary story of this diverse and highly successful group of arthropods, which are found on every

continent except Antarctica.

University of Manchester scientists, working with colleagues at the American Museum of Natural History, say the X-ray imaging techniques used have allowed them to reveal features of the unusually well-preserved [fossil](#) like never before.

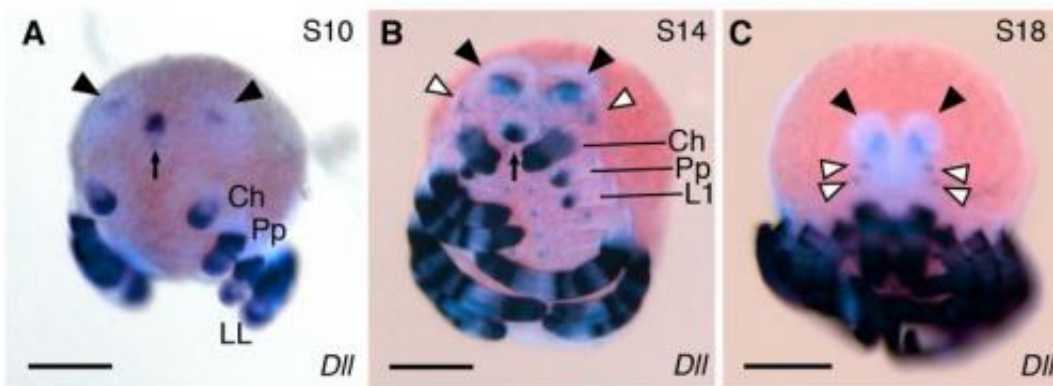
The primitive fossilised harvestman, named *Hastocularis argus*, was found in eastern France and had not only median eyes – those found near the centre of the body – but lateral eyes on the side of the body as well.

"Although they have eight legs, harvestmen are not spiders; they are more closely related to another arachnid, the scorpion," said author Dr Russell Garwood, a palaeontologist in the University of Manchester's School of Earth, Atmospheric and Environmental Sciences.

"Arachnids can have both median and lateral eyes, but modern harvestmen only possess a single set of median eyes - and no lateral ones. These findings represent a significant leap in our understanding of the evolution of this group."

The team supported their results by examining the expression of an 'eye stalk' gene in living harvestmen and found that in a modern harvestman embryo this gene shows hints of a now-lost lateral eye.

Co-author Prashant Sharma, a postdoctoral researcher at the American Museum of Natural History, said: "Terrestrial arthropods like harvestmen have a sparse fossil record because their exoskeletons don't preserve well. As a result, some fundamental questions in the evolutionary history of these organisms remain unsolved.



This figure shows the progressive developmental stages of modern harvestmen embryos with the expression of a gene that patterns outgrowths, like eye stalks (shown with black staining). In this particular species, adults only have a single pair of median eyes along the middle of the body. White arrowheads indicate domains associated with lateral eye fields, which never actually develop. Black arrowheads indicate the strong expression of the domains that will eventually form the median eyes. Credit: ©AMNH/P. Sharma

"This exceptional fossil has given us a rare and detailed look at the anatomy of harvestmen that lived hundreds of millions of years ago. What we were also able to establish is that developing modern harvestmen embryos retain vestiges of [eye](#)-growth structures seen only in the fossil."

Dr Garwood added: "Harvestmen fossils preserved in three dimensions are quite rare and our X-ray techniques have allowed us to reveal this exceptional fossil in more detail than we would have dreamed possible just a couple of decades ago."

More information: 'A Palaeozoic stem group to mite harvestmen revealed through integration of phylogenetics and development,' R. Garside, P. Sharma, J. Dunlop and G. Giribet, *Current Biology*, 2014.

Provided by University of Manchester

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