Tiny insect brains capable of huge feats

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A male hoverfly, *Eristalis*, attempting to woo a female (feeding from the flower) with his impressively controlled hovering flight. The flies use visual motion to stabilize and control their flight and to maintain their distance from nearby objects. Credit: Photo by Doekele Stavenga

Insects may have tiny brains the size of a pinhead, but the latest research from the University of Adelaide shows just how clever they really are.

For the first time, researchers from the University's Discipline of Physiology have worked out how insects judge the speed of moving objects.

It appears that insect brain cells have additional mechanisms which can calculate how to make a controlled landing on a flower or reach a food source. This ability only works in a natural setting.

In a paper published in the international journal Current Biology, lead

author David O'Carroll says insects have well identified brain cells dedicated to analysing visual motion, which are very similar to humans.

"It was previously not understood how a tiny insect brain could use multiple brain pathways to judge motion," Associate Professor O'Carroll says.

"We have known for many years that they can estimate the direction of moving objects but until now we have not known how they judge speed like other animals, including humans.

"It appears they take into account different light patterns in nature, such as a foggy morning or a sunny day, and their brain cells adapt accordingly.

"This mechanism in their brain enables them to distinguish moving objects in a wide variety of natural settings. It also highlights the fact that single neurons can exhibit extremely complex behaviour."

Assoc. Prof. O'Carroll co-authored the paper with Paul Barnett, a Physiology PhD student at the University of Adelaide, and Dr Karin Nördstrom, a former Physiology Postdoctoral Fellow at Adelaide who is now based at Uppsala University in Sweden.

Their specific research is focused on how the brain makes sense of the world viewed by the eye, using the insect visual system as an important model.

"Insects are ideal for our research because their visual system accounts for as much as 30% of their mass, far more than most other animals," Assoc. Prof. O'Carroll says.

His team is collaborating with industry to develop artificial eyes in

robots, mimicking human and insect vision.

Provided by University of Adelaide