

Bees show sophisticated learning abilities

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New ANU research shows the learning abilities of bees are robust and flexible.

Honeybees have robust and flexible memory systems that enable them to apply abstract rules to solve novel problems, according to new ANU research.

Although the brains of these insects are very small, over the past decade scientists have realised that honeybees are able to learn a variety of complex tasks, research leader Dr Shaowu Zhang, from the Research School of Biological Sciences at ANU, said.

“We set out to test just how robust the learning and memory talents of the honeybee are, with a view to learning more about their brain processes in general,” he said.

The researchers conducted a series of laboratory experiments in a custom-built All-Weather Bee Flight Facility at ANU, in which they

trained bees to fly first through a tunnel and then a maze.

To receive a reward — a sugar water solution — the bees had to remember a particular pattern they had seen earlier in the tunnel (for example, concentric rings) and use it to choose a correct path in the maze.

The researchers varied the length of the tunnel to test the insects' memory and found they could remember a pattern up to five seconds after first seeing it, showing that working memory in the honeybee was more robust than previously believed.

“Impressively, trained honeybees could even learn the order of patterns in a sequence, and choose to ‘pay attention to’, for example, only the first of two patterns in a sequence, while ‘ignoring’ the second (or vice versa) and use it to choose a correct path in the maze,” Dr Zhang said.

“They could apply that ‘knowledge of the order’ in a sequence of new patterns to make a correct choice in the maze. These results suggest a potential for greater learning abilities in honeybees than had been expected.

“This shows to us that honeybees have a remarkably robust and flexible working memory, in spite of having a very small brain, and much fewer neural connections than the average vertebrate.

“The study therefore provides more evidence for the usefulness of the honeybee as a model system to investigate complex phenomena, such as learning and memory. It even hints at the emergence of a primitive intelligence from a small brain.”

The results of the study by researchers from ANU and the Universitaet Wuerzburg in Germany were published this week in Proceedings of the

National Academy of Sciences.

Source: ANU

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