'Ancient brain' helps us avoid accidents

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(Medical Xpress)—Scientists at Australia's Vision Centre (VC) have found a group of rare cells in the human brain that recognise edges – helping us to avoid accidents and recognise everything we use or see in daily life.

To their surprise, they located the cells in the 'primitive' brain - the part of our brain that was previously just thought to pass information from the eye to the higher brain, or cortex, to interpret it.

Their discovery has thrown new light on how the vision system of humans and other primates operates – and how we use vision to move around, find food, read, recognise faces and function day-to-day.

Importantly, the knowledge could help develop medical devices for reversing blindness such as the bionic eye, says Professor Paul Martin of The VC and The University of Sydney (USyd).

"Our eyes and brain work together to give us a recognisable world," Prof. Martin explains. "The eyes send the light signals they detect to the cortex or 'modern' brain which is responsible for higher functions like memory, thought and language."

"Our vision cells respond to different information – some to colour, some to brightness, and now we've found the ones that respond to patterns," Dr Kenny Cheong of The VC and USyd adds. "If you look at your computer screen, you'll see it has four sides, and each side has an orientation – horizontal or vertical. The cells are sensitive to these 'sides'."

What most surprised the researchers was the location of these cells. "We found these cells in the thalamus, which previously was only thought to pass information from the eyes to the cortex," Dr Cheong says.

"This means that the cortex, or the 'new' brain, isn't the only place that forms an image for us," says Prof. Martin. "Even in the early stages, there are multiple pathways and signals going into the brain, so it isn't simply doing a step by step construction of the world.

"While other animals including cats, rabbits, bees and chickens also have edge detecting cells, this is the first study to indicate that primate vision – including human vision – does not all happen in the cortex."

These cells are also exceedingly rare, Prof. Martin says. "We actually saw them ten years ago, but these were a few cells out of thousands, so we thought that it was a mistake and discarded the data.

"But they cropped up every once in a while, and when we finally put them together, they look much more like cells in the cortex than in the thalamus."

Dr Cheong says the study provides a better understanding of the visual system, which is crucial for the development of devices or treatments to restore vision.

"People who lose their vision lack the nerve cells that respond to light, which contains information such as colour, brightness and patterns," he says. "So to develop a device like the bionic eye, we have to replicate the visual system, including these cells, using electronics. This means we must know what cells are present, how they work and what information they send to the brain."

The study "Cortical-like receptive fields in the lateral geniculate nucleus of marmoset monkeys" by Soon Keen Cheong, Chris Tailby, Samuel G. Solomon and Paul R. Martin was published in The *Journal of Neuroscience*. See: www.jneurosci.org/content/33/16/6864.full

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