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Research shows brain cells make clever connections

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(PhysOrg.com) -- University of Queensland research has revealed that growing nerve fibres may navigate by using a clever mathematical trick.

Associate Professor Geoff Goodhill, from UQ's Queensland Brain Institute and School of Mathematics and Physics, led the interdisciplinary team of neuroscientists and mathematicians behind the research.

They carefully measured how the guidance of nerve fibres from rat brains changed as the cues directing their growth varied, and showed these changes could be accurately predicted using a mathematical model.

Most interestingly, this model assumed nerve fibres make decisions in the cleverest possible way.

“This means that individual nerve fibres can be incredibly smart in the way they sift through information in their environment to decide where to grow,” Dr Goodhill said.

The research paper, published this month in the scientific journal the Proceedings of the National Academy of Sciences, is the first time anyone has quantitatively predicted how nerve fibres behave.

Dr Goodhill said these results could be important for understanding how brain wiring can go wrong during development and how to help brain connections regenerate after injury.

“Getting the wiring right is absolutely critical for brains to function properly,” he said.

“The mathematical model now allows us to predict what will happen in any situation, not just the ones we've already measured.”

Dr Goodhill's team is now working on how nerve fibres turn their smart decisions into smart actions.

The research paper A Bayesian model predicts the response of axons to molecular gradients appears in the 8 June issue of the Proceedings of the National Academy of Sciences.

Source: The University of Queensland

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