My New Scientist

Home | In-Depth Articles | Back to article

Mind maths: Battles for attention fought in the brain

06 February 2013 by **Colin Barras**
Magazine issue 2903. **Subscribe and save**
For similar stories, visit the **The Human Brain** Topic Guide

The way different neural networks compete for dominance echoes the battle for survival between predators and prey – the result may be your wandering mind

Read more: "Mind maths: Five laws that rule the brain"

Competing activity between brain regions resembles the perpetual fight between predator and prey *(Image: Federico Veronesi/Getty)*

As your mind flits from thought to thought, it may seem as if dozens of sensations and ideas are constantly fighting for your attention. In fact, that's surprisingly close to the mark; the way different neural networks compete for dominance echoes the battle for survival between a predator species and its prey, and the result may be your wandering mind.

Mikhail Rabinovich at the University of California in San Diego and Gilles Laurent at the California Institute of Technology in Pasadena were the first to notice this strange dynamic. They were studying the neuronal activity in the antennal lobe - the insect equivalent of the olfactory bulb in the mammalian brain - as locusts experienced different odours. Rabinovich expected the activity to flatline when they got used to each smell, but he was wrong. "Even when the scent stimulus was constant, the activity of the principal neurons in the antennal lobe changed with time," he says.

Looking closely, Rabinovich noticed that the pattern of activity was not random, but similar to the form described by mathematicians Alfred Lotka and Vito Volterra in the early 20th century. The Lotka-Volterra equations, also known as predator-prey equations, are a key ecological tool for predicting fluctuations in populations of interacting species. A predator near-exhausts its supply of prey, and so starves while its prey recovers, and the cycle starts again.

Rabinovich dubs such perpetual fights "winnerless competitions" and he says they occur in the brain as well. Here, though, the fight is not between just two competitors, but between multitudes of cognitive patterns. None ever manages to gain more than a fleeting supremacy, which Rabinovich thinks might explain the familiar experience of the wandering mind. "We can all recognise that thinking is a process," he says. "You are always shifting your attention, step-by-step, from one thought to another through these temporary stable states."

People with psychiatric conditions might benefit from the work. In the past, conditions like attention-deficit hyperactivity disorder were studied by looking at the quick snapshots of neural activity. But Rabinovich's work gives neuroscientists a tool to make sense of the brain's responses as they evolve with time, potentially explaining why the attention drifts in unusual ways. Working with Alexander Bystritsky at the University of California in Los Angeles, Rabinovich has already shown that his equations can accurately describe the neuronal activity associated with both ADHD and obsessive compulsive disorder (*Journal of Psychiatric Research*, vol 46, p 428). "They are very convenient for diagnosing the disorders," he says.

This article appeared in print under the headline "Preying on your mind"

***Colin Barras** is a writer based near Ann Arbor in Michigan*

From issue 2903 of New Scientist magazine, page 38.

Vind ik leuk 0 Tweet 0 g+1 0 2