

Compelling evidence that brain parts evolve independently

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An evolutionary biologist at the University of Manchester, working with scientists in the US, has found compelling evidence that parts of the brain can evolve independently from each other. It's hoped the findings will significantly advance our understanding of the brain.

The unique 15 year study with researchers at the University of Tennessee and Harvard Medical School also identified several [genetic loci](#) that control the size of different brain parts.

The aim of the research was to find out if different [parts of the brain](#) can respond independently of each other to evolutionary [stimulus](#) (mosaic evolution) or whether the brain responds as a whole (concerted evolution). Unlike previous studies the researchers compared the brain measurements within just one species. The findings have been published in the journal *Nature Communications*.

The brains of approximately 10,000 mice were analysed. Seven individual parts of each brain were measured by volume and weight. The entire [genome](#), except the [Y chromosome](#), was scanned for each animal and the gene set for each brain part identified.

Dr Reinmar Hager from the Faculty of Life Sciences compared variation in the size of the brain parts to variation in the [genes](#). He found that the variation in the size of brain parts is controlled by the specific gene set for that brain part and not a shared set of genes.

He also compared the measurements for each mouse to the overall size of its brain. Surprisingly he found very little correlation between the sizes of the brain parts and the overall size of the brain.

Dr Hager says: "If all the different brain parts evolved as a whole we would expect that the same set of genes influences size in all parts. However, we found many gene variations for each different part of the brain supporting a mosaic scenario of [brain evolution](#). We also found very little correlation between the size of the brain parts and the overall size of the brain. This again supports the mosaic evolutionary hypothesis."

Using the data collected from the mice Dr Hager and colleagues analysed the genes that influence the size of the brain to the genes that control the size of the body. They wanted to find out how independent size regulation of the brain is to that of the body.

They found evidence that the size of the brain is governed by an independent gene set to the one that controls the size of the body. Again they found very little [correlation](#) between variations in the size of the body and the brain.

The evidence means that overall brain size can evolve independently of body size.

Following this research more work will be carried out to identify the specific genes that underlie the size of different parts in the brain.

Dr Hager says: "If we can identify the specific genes that cause variations in the size of brain parts then there will be big implications for researchers looking at neuronal disease and brain development. We hope this research will significantly advance our understanding of the brain."

Provided by University of Manchester

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