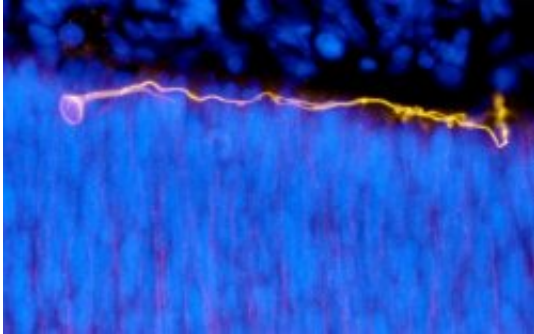


The beginnings of the thinking brain

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Oxford researchers have identified the very first neurons in the human cerebral cortex, the part of the brain that sets us apart from all other animals.

Dr Irina Bystron and colleagues from the Department of Physiology, Anatomy and Genetics at the University of Oxford, together with Professor Pasko Rakic, a leading neuroscientist at Yale University, describe for the first time in *Nature Neuroscience* the very earliest nerve cells in the part of the developing human brain that becomes the cerebral cortex.

The cerebral cortex is largely responsible for human cognition, playing an essential role in perception, memory, thought, language, mental ability, intellect and consciousness. It is also responsible for our voluntary actions. As adults our cerebral cortex accounts for 40 per cent

of the brain's weight and is composed of about 20 billion neurons. The new findings show that its first neurons are in place much earlier than previously thought – approximately 31 days after fertilization, when the entire embryo is only about 4 mm long and shaped a bit like a comma, before the development of arms, legs or eyes.

The team used cutting-edge techniques, including technologies that allowed them to study which genes are turned on in individual cells. These methods enabled them to identify the first neurons, which they call 'predecessor' cells.

Predecessor cells are unusual in many respects. Unlike normal nerve cells, they do not have fibres connecting to other neurons. They do, however, have very long thick processes, or 'tails', one stretching out in front of the cell body, the other trailing behind. Analysis of the skeleton of these cells suggests that they move upwards in the surface of the developing brain and enter the future cortex. Their processes form a vast network, and the researchers speculate that this web of processes might be used to guide the migration and development of later cells. Professor Colin Blakemore, one of the authors on the paper, said: 'We suspect that these early cells have a special role in development, setting the scene for and controlling neurons that are generated later, and dying when their job is done.'

Unravelling the early development of the cerebral cortex may help in understanding the many developmental disorders of higher brain function, such as autism, schizophrenia, childhood epilepsy, developmental dyslexia and mental retardation.

It might also provide the key to a question that has puzzled evolutionary biologists, namely how the cerebral hemispheres of our hominid ancestors expanded massively, starting about five million years ago. Despite only a 1 per cent genetic difference between humans and

gorillas, the human cerebral cortex is four times larger, and our ability to think, understand and to develop culture is dramatically different. It is possible that understanding the way the cerebral cortex develops, and how its development differs from that of other animals, might help explain what happened to give us such clever brains. The researchers are particularly interested in the fact that predecessor cells have never been described in other animals. 'A re-examination of early brain development in other species is urgently needed to determine whether predecessor cells are really unique to the human brain,' said Dr Bystron.

Source: University of Oxford

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