Scientist: Human brain could be replicated in 10 years

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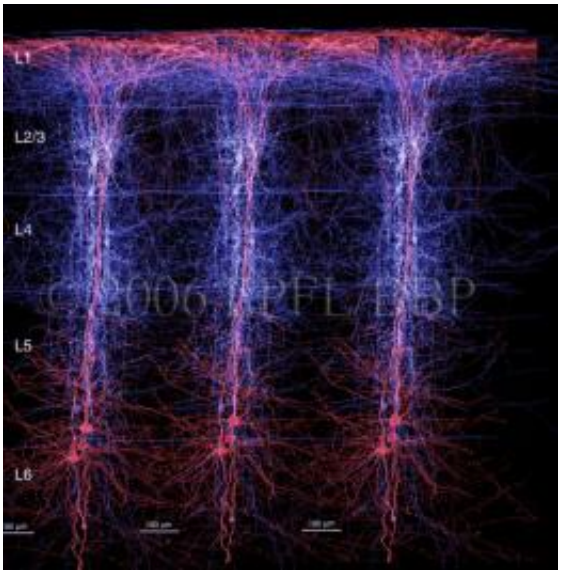

Activity in the brain's neocortex is tightly controlled by inhibitory neurons shown here which prevent epilepsy (Blue Brain Project; Ecole Polytechnique Federale de Lausanne)

A model that replicates the functions of the human brain is feasible in 10 years according to neuroscientist Professor Henry Markram of the Brain Mind Institute in Switzerland. ‘I absolutely believe it is technically and biologically possible. The only uncertainty is financial. It is an extremely expensive project and not all is yet secured.'

The apparent complexity of the human mind is not a barrier to building a

‘replica' brain claims Professor Markram. ‘The brain is of course extremely complex because it has trillions of synapses, billions of neurons, millions of proteins, and thousands of genes. But they are still finite in number. Today's technology is already highly sophisticated and it allows us to reverse engineer the brain rapidly'. An example of the capability already in place is that today's robots can do screenings and mappings tens of thousands of times faster than human scientists and technicians.

Another hurdle on the path to a model human brain is that 100 years of neuroscience discovery has led to millions of fragments of data and knowledge that have never been brought together and exploited fully. ‘Actually no- one even knows what we already understand about the brain', says Professor Markram, ‘A model would serve to bring this all together and then allow anyone to test whatever theory you want about the brain. The biggest challenge is to understand how electrical-magnetic-chemical patterns in the brain convert into our perception of reality. We think we see with our eyes, but in fact most of what we ‘see' is generated as a projection by your brain. So what are we actually looking at when we look at something ‘outside' of us?'

For Professor Markram, the most exciting part of his research is putting together the hundreds of thousands of small pieces of data that his lab has collected over the past 15 years, and seeing what a microcircuit of the brain looks like. ‘When we first switched it on it already started to display some interesting emergent properties. But this is just the beginning because we know now that it is possible to build it. As we progress we are learning about design secrets of our brains which were unimaginable before. In fact the brain uses some simple rules to solve highly complex problems and extracting each of these rules one by one is very exciting. For example we have been surprised at finding simple design principles that allow billions of neurons to connect to each other. I think we will understand how the brain is designed and works before

we have finished building it'.

The opportunities for this neuroscience research challenge are immense explains Professor Markram: ‘A brain model will sit on a massive supercomputer and serve as a kind of educational and diagnostic service to society. As the industrial revolution in science progresses we will generate more data than anyone can track or any computer can store, so models that can absorb it are simply unavoidable. It is also essential to build models when it comes to treating brain diseases affecting around two billion people. At present, there is no brain disease for which we really understand what has gone wrong in the processing, in the circuits, neurons or synapses. It is also important if we are to replace the need for the millions of animal experiments each year for brain research'.

Source: AlphaGalileo