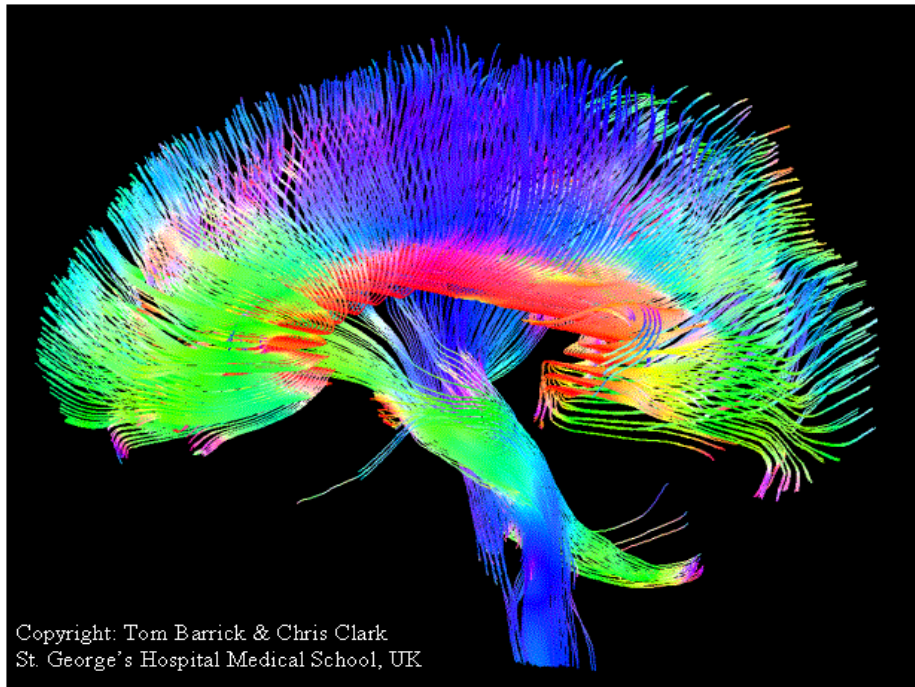# Segmentation of White Matter Structures Using Fibre Tracking:
Towards Establishing a White Matter Atlas of the Brain

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The functions of the human body such as movement, thought and vision involve different parts of the brain in the outer layer called the cortex, which is where electrical signals are generated. These signals travel across to the inner part of the brain, known as the white matter, and onto other parts of the body.

The white matter consists of many pathways and can be thought of as a complicated network of electrical cables, just like those you might find in your home. A break in one of the cables might result in the lights to one part of your house not working, while the others continue to work normally.

The brain works in a similar way; damage to the white matter pathway that connects the motor cortex to the rest of the body will result in a loss of movement, whereas damage to a different pathway will result in a different problem. Until now it has been very difficult to obtain pictures of these white matter pathways.

However, a new magnetic resonance imaging technique called diffusion tensor tractography allows us, for the first time, to obtain images of these pathways by studying the way in which water moves in the brain. The white matter pathways of the brain can be highlighted because water can move more freely along them.

Neuroscientists and neurologists are concerned with how the brain works and how its functions are affected by disease. By producing detailed pictures of the white matter pathways in the brain we now have the opportunity to examine more closely how damage to different parts of the white matter can lead to a loss of function and disability. The development of an atlas of the brain showing the white matter connections in any individual will help neurologists to better understand diseases such as multiple sclerosis, stroke, Alzheimer's disease and other diseases of the brain.