Future Computers Could Be Built from Magnetic 'Tornadoes'

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Computers of the future could be built from 'magnetic tornadoes', according to new research into nanotechnology at the University of Sheffield.

Magnetic materials form the basis of most hard disc drives as they are able to store data. The team – from the University's Faculty of Engineering - have been investigating whether they could also be used to perform calculations, and so take on the role of a computer's central processing unit (CPU).

Lead researcher, Dr Tom Hayward, explains: "Magnetic materials are useful for data storage because they can retain information without consuming energy. A computer built around a CPU made of magnetic materials should be much more power efficient than existing technologies, as it should be able to function with minimal energy consumption."

Using computer simulations, the team have shown it is possible to create magnetic 'logic gates', the fundamental building blocks of a CPU, using magnetic materials. The results are published this month in *Physical Review Applied*.

Dr Hayward says: "In wires of magnetic material, two hundred times thinner than a human hair, magnetism can form into swirling 'tornadoes', known as magnetic vortex domain walls. In our simulations, we use vortices where the magnetism turns clockwise to represent 0 and vortices where it turns anticlockwise to represent 1, allowing us to encode binary data. The vortices are then flowed through the wires using, and interacted with, carefully defined features in the wires that recreate the function of logic gates."

The researchers now plan to build experimental prototypes of the logic gates, and to investigate whether they can be made smaller and to operate faster – critical steps in developing the concept into a usable technology.

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