‘Atom-chips’ research wins multi-million pound funding

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Physicists at The University of Nottingham are to use refrigerators made from light that can cool atoms to the lowest temperature in the Universe to develop the next generation of ultra-small electronic devices.

The academics, in collaboration with colleagues at The University of Birmingham, have been awarded almost £6 million from the Engineering and Physical Sciences Research Council (EPSRC) for the creation of a new Midlands Ultracold Atom Research Centre.

Academics at the centre will use state-of-the-art laser beams to cool atoms to a few billionths of a degree above absolute zero — which is around 10 billion times colder than temperatures in the Arctic. Cooling the atoms to these temperatures causes them to slow down, changing their behaviour and enabling scientists to harness this area of quantum physics for a range of novel uses.

One such use, to be developed at Nottingham, is the creation of revolutionary ‘atom-chips’, which are similar to micro-chips used in electronic devices such as laptops but work by using magnets to guide entire cold atoms — rather than electrons — around air tracks above the chip like microscopic magnetic levitation trains.

The ‘atom-chips’ can then be used to build high-precision sensors into a range of electronic devices. These could have many applications, for example, in high-precision navigation, underground mapping and oil prospecting and high-performance computers.

Professor Mark Fromhold, of Nottingham's School of Physics and Astronomy, said: "Although the atoms are so cold, they have built in quantum heat shields whose performance is equivalent to keeping a snowball frozen at the centre of the sun."

Colleagues at Birmingham will work on the same area of quantum physics but will concentrate on atoms moving in 'optical lattices', crystals made from light.

The funding for the Midlands Ultracold Atom Research Centre comes from the third round of Science and Innovation Awards from the EPSRC, which is funding research projects across the UK to the tune of £31 million.

Source: University of Nottingham