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Quantum trick for pressure-sensitive mobile devices

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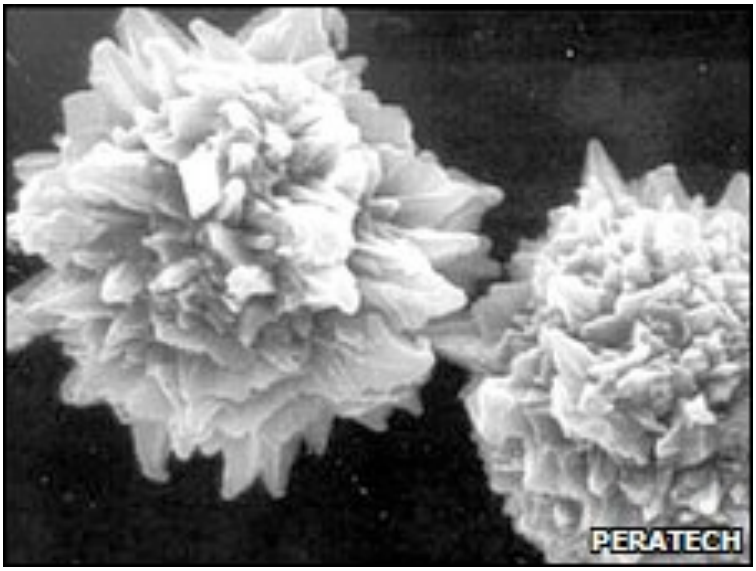

These mace-shaped particles use quantum physics to control current

Hand-held devices could soon have pressure-sensitive touch-screens and keys, thanks to a UK firm's material that exploits a quantum physics trick.

The technology allows, for example, scrolling down a long list or webpage faster as more pressure is applied.

A division of Samsung that distributes mobile phone components to several handset manufacturers has now licensed the "Quantum Tunnelling Composite".

The approach could find use in devices from phones to games to GPS handsets.

In January, Japanese touch-screen maker Nissha also licensed the approach from Yorkshire-based Peratech, who make the composite material QTC.

However, as part of the licensing agreements, Peratech could not reveal the phone, gaming, and device makers that could soon be using the technology to bring pressure sensitivity to a raft of new devices.
Besides control for scrolling, the pressure-sensitivity could lead to a "third dimension" in touchscreens.
For instance, instead of many "2-D" pages of applications, they could be grouped by type on a single page - using the press of a finger to dive into each type and select the desired app.

Quantum mace

The composite works by using spiky conducting nanoparticles, similar to tiny medieval maces, dispersed evenly in a polymer.
None of these spiky balls actually touch, but the closer they get to each other, the more likely they are to undergo a quantum physics phenomenon known as tunnelling.
Tunnelling is one of several effects in quantum mechanics that defies explanation in terms of the "classical" physics that preceded it.
Simply put, quantum mechanics says that there is a tiny probability that a particle shot at a wall will pass through it in an effect known as tunnelling.

The pressure-sensitive key can already be found in an available handset

Similarly, the material that surrounds the spiky balls acts like a wall to electric current. But as the balls draw closer together, when squashed or deformed by a finger's pressure, the probability of a charge tunnelling through increases.
The net result is that pressing harder on the material leads to a smooth increase in the current through it.
There are a number of ways to make switches or screens pressure-sensitive, such as using mechanical switches.
However, the QTC approach is particularly suited to making thin devices. Pressure-sensitive QTC switches can be made 70 micrometres thick - about the thickness of a human hair.
QTC is better than switches based on so-called "conducting polymers", because they conduct no electricity until they are pressed, leading to better overall efficiency.
Samsung Electro-mechanics has now incorporated the QTC into the navigation switch familiar on smartphones - in addition to the up, down, left, right and centre button, the up and down functions are pressure-sensitive.
This is useful for scrolling more or less quickly through, for example, a long list of emails.

"That same model can be used in many other ways, like in games: to control how hard I want to jump or run for example," said Peratech's chief executive Philip Taysom.
"Electronics are being given the ability to sense something that we take for granted, which is how much we're touching and applying force," he told BBC News.
Further applications that Peratech is involved with include robotics. While much work has gone into giving robots sensitivity to pressure and touch in their fingers, Mr Taysom said there can now be a push to create robots whose whole surface - rather like humans themselves - is pressure-sensitive.