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TO REVOLUTIONISE electronics, researchers may have to keep their faces straight—the faces of their semiconductors, that is. Rough spots on surfaces of semiconductors topple spinning electrons, says a team of physicists, so avoiding them could be key to developing "spintronics," which uses electrons all spinning in the same direction.

Conventional electronics simply exploits electrons' charge, but a flow of electrons spinning in the same direction also carries a "spin current". This gives circuit designers another property to play with, and researchers hope to use spin currents to create everything from optical sensors to "qubits", the ephemeral bits of information manipulated by quantum computers.

But while spin currents travel easily through semiconductors, the challenge is in getting them to flow into the materials in the first place. "There's a lot of scattering at the interface that degrades the transport of spin," says Vincent LaBella of the University of Arkansas in Fayetteville.

Now LaBella and his colleagues have shown that much of that scattering is caused by atomic-scale imperfections on the surface. They used a scanning tunnelling microscope to pass a tiny current through a nickel tip less than a nanometre wide, across a gap and into a crystal of gallium arsenide. Because the nickel tip also consisted of a single crystal, it produced a completely polarised flow of electrons.

When the tip hovered above the smooth face of the crystal, the current remained more than 90 per cent polarised. But when the tip hovered near a step in the surface just 5 nanometres high, the polarisation plummeted to a sixth of the original value.

"The data is absolutely beautiful," says David Awschalom of the University of California, Santa Barbara. Awschalom says the makers of spintronic devices may try to avoid surface defects by making metal contacts small enough to fit between such imperfections.

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More at: *Science* (vol 292, p 1518)