and Alq3. This sounds very similar to the recently reported spin filtering at the interface between Cobalt and flat geometry zinc methyl phenalenyl molecules[6], so now at least two mechanisms for spin filtering at metal-organic interfaces have been demonstrated.

To cut a long story short, Steil *et al.* succeeded in capturing the majority and minority spin electrons as they cross the Co/Alq3 interface. This is perhaps the first time that we have had all the clues to build a clear picture of spin filtering at an interface, and this makes a real difference; providing us with a powerful and easily understandable means for tailoring interfaces for spintronics. ❐

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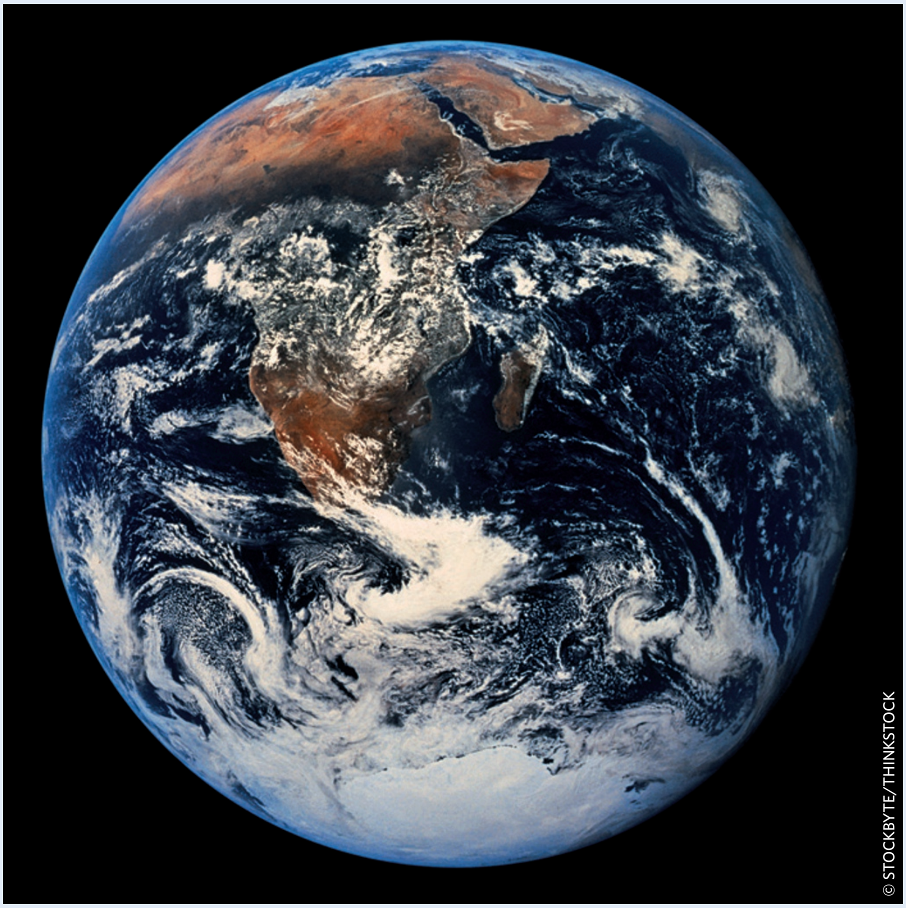
FUNDAMENTAL PHYSICS

All the world's a lab

The Earth itself has a role to play in the search for esoteric fundamental particles, according to two research teams who are using the planet to perform experimental tests of some of the most advanced theories of the Universe yet developed (K. Bendtz *et al. Phys. Rev. Lett.* Preprint at http://arxiv.org/abs/1301.6530; 2013 and L. Hunter *et al. Science* **339,** 928-932; 2013).

Katarina Bendtz and colleagues hope the Earth might be a good place to look for magnetic monopoles. An isolated magnet with only a north (or only a south) pole is strictly forbidden by the laws laid down by high-school physics teachers; and the closest that scientists have come to realizing them, in solid-state materials, are merely approximations. Grand unified theories suggest that monopoles might actually exist, but are likely to have a mass far beyond the energy capability of a modern particle collider. So instead Bendtz and the team have investigated the possibility that magnetic monopoles created in the early stages of the Universe might have become trapped in the core of the infant Earth, when it was no more than a molten furnace.



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They looked at rock that might once have been at the interface between the Earth's mantle and its core, about 2,900 km below the surface; igneous rock spewed to the surface in volcanic eruptions at some point in the last 65 million years. The samples were passed through the superconducting coils of a magnetometer, in search of a persistence-current indicative of a monopole. The results, unfortunately, came up negative, implying that there were fewer than 1.6 monopoles for every 10^{28} protons or neutrons. So the search goes on.

Larry Hunter and co-workers are looking for particles predicted in some of the potential extensions of the Standard Model. Spin-one axial bosons, it has been suggested, can mediate a long-range force between two spins. Hunter *et al.* propose that it might be possible to use the Earth as a giant spin source and measure this long-distance interaction using a sensitive magnetometer in the lab. Tests of such spin–spin interactions have previously involved optically pumped nuclear sources that offer about 10^{25} polarized electrons. The Earth, on the other hand, could provide as many as 10^{42} electrons polarized antiparallel to its magnetic field.

A first step is to fully map out electron polarization within the Earth: Hunter *et al.* have now accomplished this by combining recent geophysics and geochemistry results. Using these data, they were able to set bounds on the spin–spin forces due to geoelectrons interacting with protons, with neutrons, with electrons — with everything.

DAVID GEVAUX