Can you feel force... Do humans react to magnetic fields?

Scientists in California believe that internal compasses might once have enabled our ancestors to navigate as animals do today.

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Fruit flies do it. Tiny northern wheatears do it. Even salmon in the seas do it. All navigate using Earth's magnetic field. In fact, hundreds of animals migrate this way, some over long distances. But one species has always been excluded from this electromagnetic orienteering club: Homo sapiens. Men and women show no evidence of possessing internal compasses, researchers have insisted.

But now this view is being challenged. In a paper in the journal eNeuro, scientists at the California Institute of Technology report evidence that men and women's brains respond to changes in magnetic fields and these alternations could allow them to differentiate north from south and navigate without compasses.

"We have found proof that humans possess a definitive sixth sense – magnetism," said project leader Professor Joseph Kirschvink. "This sensory modality is real. It could explain why some people have better senses of direction than others, for example. It might even be possible
one day to restore our ancestral ability to use magnetic fields to navigate."

The claims are controversial, however. Other researchers say Kirschvink's experiments might have shown the brain responds to changes in magnetic fields but that does not mean they represent the actions of an internal magnetic sense. "If I were to stick my head in a microwave and switch it on, I would see effects on my brain waves," a biophysicist, Thorsten Ritz from the University of California, Irvine, told the journal Science. "That doesn't mean I have a microwave sense."

It is a contentious issue, and on Friday it will be debated at a conference on animal migration held by the Royal Institute of Navigation at Egham, near London. Kirschvink will attend. "I expect sparks to fly," he told the Observer.
In his experiments, Kirschvink – working with colleagues in the US and Japan – placed volunteers inside six-sided aluminium cages that could protect them from Earth's magnetic field. Participants' brain waves were measured while differing magnetic fields were artificially induced inside the cages.
A total of 34 men and women took part, and the team discovered that certain orientations they induced in the magnetic fields caused their alpha brain waves to drop significantly. Such changes normally happen when the brain is processing information. "Essentially, their brains were freaking out in response to changes in magnetic fields," said Kirschvink.
Other scientists are more cautious. "This is very interesting research but it needs to be replicated before we can think of supporting claims that humans can detect and exploit magnetic fields," said Professor Peter Hore of Oxford University.
In addition, the results produced by Kirschvink's volunteers are modest compared with the kinds of responses to magnetic fields achieved by other species, such as the northern wheatear bird, which regularly travels from Alaska to Kenya on return journeys of some 19,000 miles.
"We have studied northern wheatears in the laboratory and we know they respond to changes in magnetic fields, so it is hard not to believe they are doing the same in the wild," added Hore, who will also be attending this week's meeting. "Of course, when they get near their destinations they probably use other senses and cues: their sense of smell, and the sun and stars, for example. Nevertheless, it is clear the northern wheatear possesses a remarkable power when it comes to detecting magnetic fields."
As to the mechanism exploited by wheatears to navigate, Hore said he believed the birds used photosensitive molecules which can be turned into one of two different chemical states depending on the direction of a magnetic field like the Earth's. "These chemicals, called cryptochromes, are in the retinas of bird's eyes, and they act as internal compasses," Hore said.
'Magnetism could explain why some people have better senses of direction than others' Professor Joseph Kirschvink
Kirschvink takes a different view. He says his research points to an alternative explanation: the existence of special cells that contain iron-based crystals. These rotate rather like the needle of a compass, opening or closing pores in the cells and altering signals sent to the brain. "They have to be there," he says.
As to why we do not witness people using internal compasses to navigate today, modern life may have obliterated their relatively weak operation in humans, it is argued.
For example, Kirschvink points to studies of Asian and Australian people who speak languages that are fundamentally different to European languages. These differences could influence our abilities to respond to weak signals from our "internal compasses".
"These people have no words for front or back or to your right. Instead they talk about looking in a direction to your north or turning to your east. These are languages of geographic reference and they are still spoken by aboriginal people."

Such languages would be better suited to responding to internal compasses, added Kirschvink, and would help men and women to think in ways that keep them tuned to their innate abilities to navigate. “European languages, which have an egocentric reference frame, may now be blocking our ability to use our brains in this way,” he added.