GRAVITATIONAL AND ELECTROMAGNETIC WAVES EXTEND UNDERSTANDING OF SUPERCONDUCTIVITY, PLANETARY FIELDS, PHOTONS AND GRAVITONS

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Abstract -

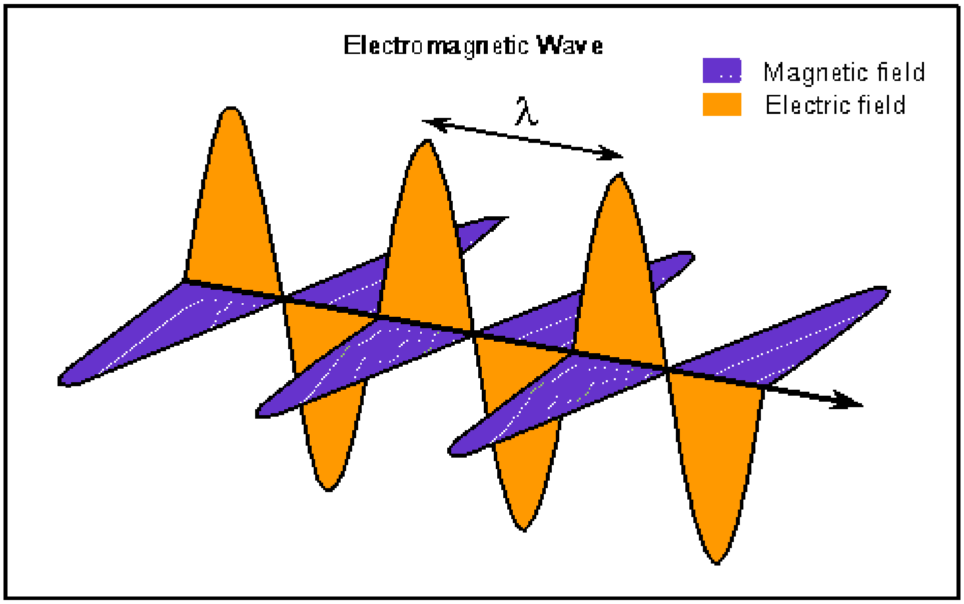
The cause of Earth's magnetic field is said to be the geodynamo, also called the magnetic dynamo theory. The heat from the solid inner core puts the liquid outer core in motion, and the movements of the outer core's electrically conducting fluids (such as molten iron) generate the planet's magnetic field. Electrically conducting fluids occur in the Sun, other stars and most planets – and are the scientifically accepted mechanism for magnetic fields. However, the planets Mercury and Venus suggest this process is only partly correct. During explanation of planetary magnetism, the strong electric field of the planet Venus is accounted for. And the article gives an alternative explanation of superconductivity which speaks of molecules as well as waves i.e. it refers to quantum mechanics' wave-particle duality. Interestingly, the use of gravitational and electromagnetic waves to aid our understanding of superconductivity and planetary fields leads to new perspectives concerning photons and gravitons.

Article -

The Meissner effect (or Meissner–Ochsenfeld effect) is the expulsion of a magnetic field from a superconductor* during its transition to the superconducting state. The German physicists Walther Meissner and Robert Ochsenfeld discovered this phenomenon in 1933. Regarding the Meissner effect: Think of the electromagnetic wave relativistically. In General Relativity, the simple analogy of space-time being regarded as a rubber sheet is commonly used. Instead of resorting to complex and lengthy relativistic mathematics, we can simply picture an electromagnetic wave as a cylinder made of rubber. If 2 sides of the cylinder are pushed in with your fingers (say, the ones representing the electric component), the sides in the perpendicular direction (representing the magnetic component) will bulge outwards - this can be verified by placing a ruler behind the cylinder. Compressing the electric component will force the magnetic component to bulge outwards ie there will be little or no magnetic field within the superconductor, only an external magnetic field. An externally-applied magnetic field also conforms to the bulging outwards and is expelled from within the superconductor.

* High temperature superconductors are known for not displaying the Meissner effect. The explanation below of planetary magnetic fields means, though the fields cannot be

a product of the condensed-matter physics known as superconductivity, they might be considered a previously unrecognized variation of superconductivity, which is zero (electrical) resistance.



An electromagnetic wave showing electric and magnetic fields, and the wavelength (λ) which is the distance between crests of a wave.

Courtesy of nrao.edu

An electromagnetic wave can have its electrical part compressed through eg introduction of copper-and-oxygen compounds called cuprates or use of hydrogen sulfide (speaking of molecules as well as waves refers to quantum mechanics' wave-particle duality). This means the explanation of superconductivity developed by John Bardeen, Leon Cooper, and John Schrieffer in1957 (for which they shared the 1972 Nobel Prize) need not depend on the Cooper pair or BCS pair - a pair of electrons (or other fermions) bound together at low temperatures in a certain manner first described in 1956 by American physicist Leon Cooper. (Cooper, Leon N. (1956). "Bound electron pairs in a degenerate Fermi gas". Physical Review. **104** (4): 1189–1190). In a Cooper pair, an electron in a metal attracts the positive ions that make up the rigid lattice of the metal. This positive charge can attract other electrons, and it has also been recently demonstrated that a Cooper pair can comprise two bosons. ("Dynamical Creation of

Bosonic Cooper-Like Pairs" by Tassilo Keilmann and Juan José Garcia-Ripoll: Phys. Rev. Lett. **100**, 110406 (2008).

John Bardeen comments - "The idea of paired electrons, though not fully accurate, captures the sense of it." (J. Bardeen, "Electron-Phonon Interactions and Superconductivity", in Cooperative Phenomena, eds. H. Haken and M. Wagner (Springer-Verlag, Berlin, Heidelberg, New York, 1973), p. 67).

Phrased non-formally, a more accurate description of superconductivity might refer to the illustration above of an electromagnetic wave. If compression is sufficient; the electric component no longer follows a long, curved path but its path is now linear and follows the shortest distance between two points. In other words, a superconductor that operates at room temperature and normal atmospheric pressure has been manufactured. Any resistance would, like a rock in the bed of a stream causing water to flow around it, lengthen the distance and mean the compound is not a perfect superconductor. This analogy to "a rock in the bed of a stream" refers to the relative non-movement of paired electrons. Superconductivity is a wave motion, where energy is transferred from one place to another without involving an actual transfer of matter. If a stone is dropped into a pool of calm water, many circular waves soon cover the surface of the water, and the water appears to be moving outwards from where the stone was dropped in. Actually, the particles of water simply rise then fall – it's the wave motion that moves outward. Similarly, the particles called paired electrons possess relatively little movement themselves – and John Bardeen's comment about the idea of paired electrons not being fully accurate can mean that superconductivity is a wave motion.

Like waves of water, electromagnetic waves are known as transverse. Consequently, the particles (photons) of light and microwaves etc that travel through space-time would have relatively little movement themselves. It's the waves of energy that travel – their amplitudes and frequencies. As Paul Camp, Ph.D. in theoretical physics, writes at https://www.quora.com/How-big-is-a-photon -

"A photon is a quantum of excitation of the electromagnetic field. That field fills all space and so do its quantum modes."

This is consistent with energy being transferred from one place to another (as wave motion) without involving an actual transfer of particles (little or no movement of photons). General Relativity says gravitation IS space-time ie the gravitational field fills all space, so the seeming motion of gravitational waves could also be due to the energy of amplitudes and wavelengths causing excitations (called gravitons) in the field. These excitations cover 186,282 miles every second. (Savard, J. "From Gold Coins to Cadmium Light". John Savard. WebCite: **http://www.quadibloc.com/other/cnv03.htm** on 2009-11-14: The speed of light is based on an inch of exactly 2.54 cm and is exactly 186,282 miles, 698 yards, 2 feet, and 5 21/127 inches per second.)

"Magnetic Fields" (http://www.astronomynotes.com/solarsys/s7.htm) says, "Mercury's situation was a major challenge to the magnetic dynamo theory. In true scientific fashion, the theory made a testable prediction: Mercury should have no magnetic field or one even less than Mars' one because its core should be solid. Observation, the final judge of scientific truth, contradicted the prediction. Should we have thrown out the magnetic dynamo theory then? Astronomers were reluctant to totally disregard the theory because of its success in explaining the situation on the other planets and the lack of any other plausible theory. Is their reluctance a violation of the objectivity required in science? Perhaps, but past experience has taught that when confronted with such a contradiction, nature is telling you that you forgot to take something into account or you overlooked a crucial process."

The idea of compressed electric fields (they could be compressed by gravitational, or gravitational-electromagnetic, waves) and bulging, expelled magnetic fields is a very plausible alternative to Earth's geodynamo. It gains additional support by explaining why the planet Mercury has a significantly strong, apparently global, magnetic field (approx. 1.1% of Earth's).(7,8,9) Venus' core is thought to be electrically conductive and, although its rotation is often thought to be too slow, simulations show it is adequate to produce a dynamo. Simple reversal – compression of electromagnetism's magnetic component with expulsion of the electric component - means certain astronomical bodies, such as the planet Venus, could have no intrinsic magnetic field as a result. (It does have a much weaker one than Earth, induced by an interaction between the ionosphere and the solar wind).(10,11,12) ***But it would have a strong electric field – and the European Space Agency's Venus Express spacecraft did detect one.***(13)

How does this alternative account for magnetic-field reversals? The incoming gravitational waves can compress electric fields, resulting in a strong magnetic field. As motions in planetary cores occur, relocated electric waves can be compressed less, causing reduced expelling of the magnetic waves and weakening of Earth's field. Electromagnetic waves can change orientation by 180 degrees, causing the expelled magnetism's polarity to reverse.

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