# Topological Materials, Unnatural Fermions, the Higgs, and Geometry

Author – Rodney Bartlett

Abstract -

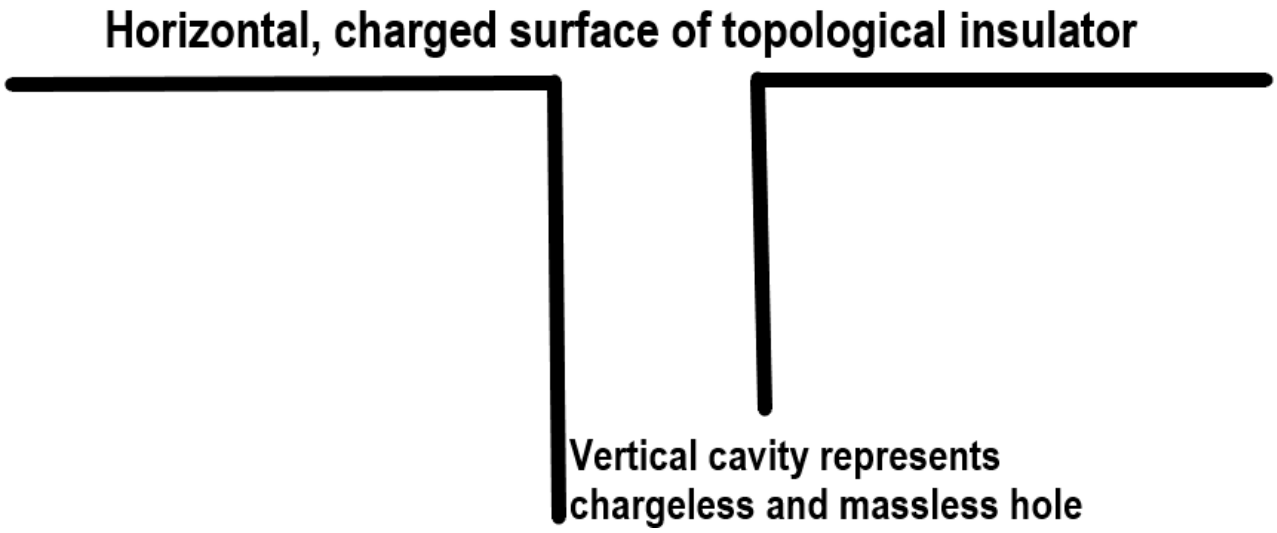
The General Theory of Relativity (1) will be useful in this article dealing with an aspect of the quantum world. Specifically – the analogy of the theory's curvature of space-time to a rubber sheet. A small body like the Earth is said to warp space-time only a little and create a dimple in the sheet. A larger body such as the Sun curves space-time much more and forms a deep valley in the rubber. And a black hole is often pictured as warping space-time so much that it tears a hole through the rubber fabric. Transferring the analogy to the quantum realm – the motion of electrons can be visualized as their gliding across hills and valleys of pure energy (gravitational energy). This is because Relativity says gravity is caused by the curvature of space-time. Therefore, gravity … gravitational energy … IS space-time. Materials that don't conduct electricity (insulators) have deep valleys which electrons struggle to escape from. In 2004, U.S.A. physicist Charles Kane noticed something strange in his computer simulations of electrons flowing through different materials**:** an insulator whose quantum state had the equivalent of a hole. Kane had not found the first quantum black hole but had discovered the first topological insulator – a then theoretical material that could conduct electricity on its surface but not within its interior. (In 2007, American physicist M. Zahid Hasan led the team that made the first 3D topological insulator.) About 90 years ago, while experimenting with the equations of quantum physics, German physicist Hermann Weyl showed that a massless and charged particle (now called the Weyl fermion) could theoretically exist. (2) In topological insulators, the hole in its quantum state causes electrons to come together and behave like a single particle called a Weyl fermion. The Weyl fermion can be related to Topological Insulators (TI), the Majorana fermion^ can be related to future quantum computers' Topological Superconductors (TS), while topological insulators and topological superconductors may be regarded as the inverse of each other. This state of topological materials and "unnatural" fermions can be expressed by another phenomenon which I call vector-tensor-scalar geometry.

^ The Majorana fermion was predicted in 1937 by Italian physicist Ettore Majorana playing with the same quantum math that had intrigued Weyl. Like a Weyl fermion, a

Majorana fermion has no mass. It also has no charge, despite being made of a bunch of negatively charged electrons. (3)

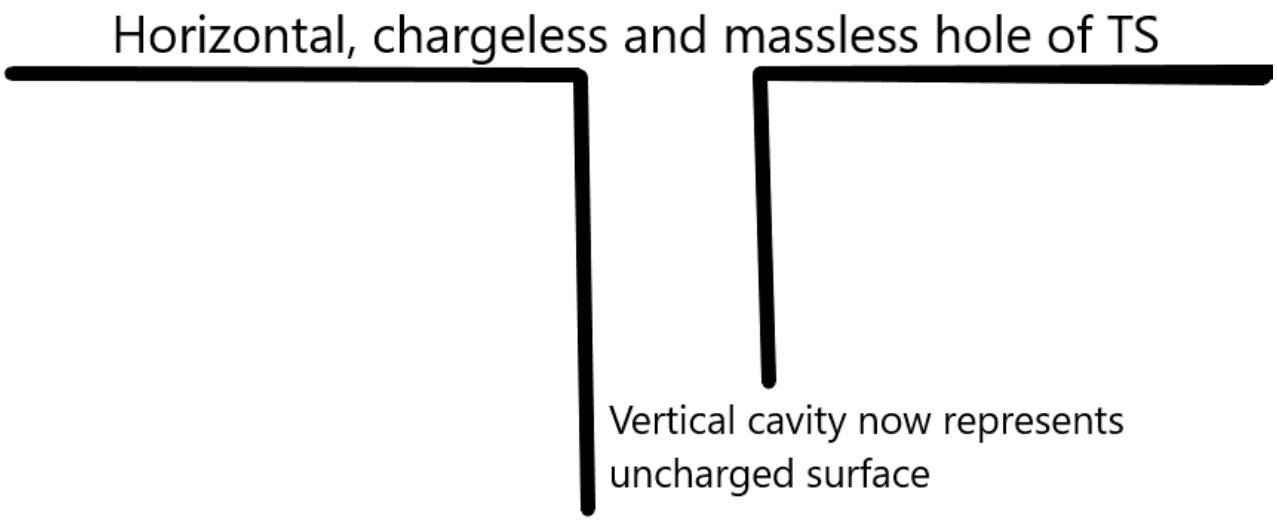
Article -

**Diagram 1 – Inversion of Diagram 2**




Combining surface and cavity produces a charged, massless Weyl fermion.

**Diagram 2 – Inversion of Diagram 1**

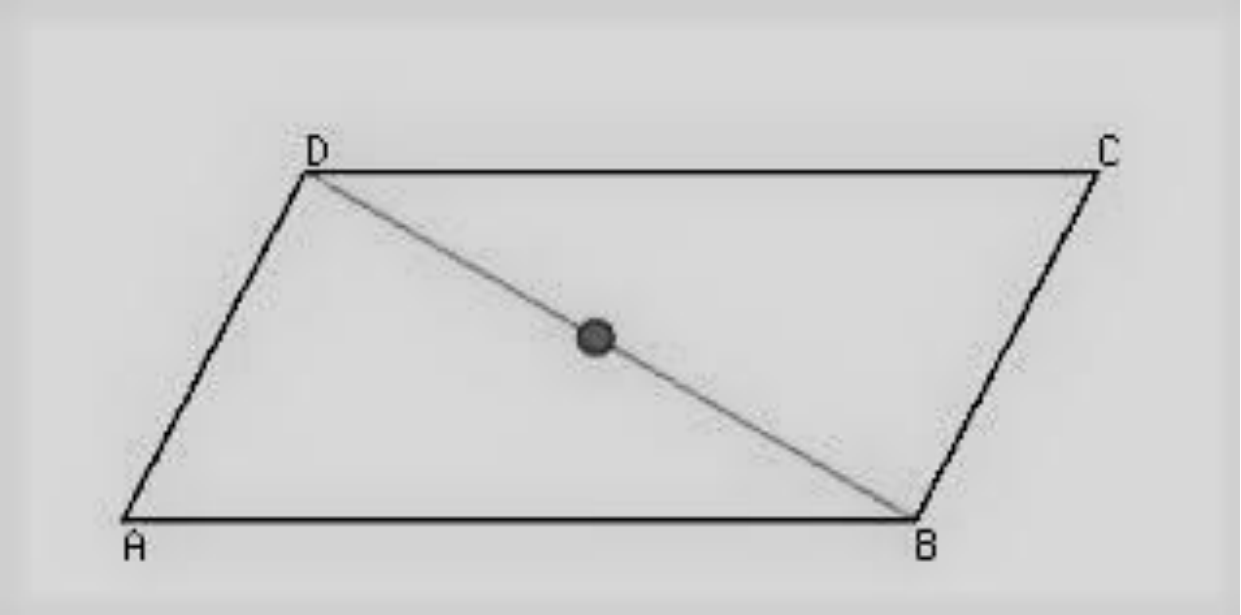



Topological superconductors are like the topological Mobius strip, and only have one surface. The uncharged surface represented by the vertical cavity above is united with

the chargeless, massless hole. Combining surface and hole produces a massless, uncharged Majorana fermion.

**Vector-Tensor-Scalar Geometry**

Diagram 1 becomes




Side DC of parallelogram = Vector 1 electrons

Side DA of parallelogram = Vector 2 electrons

The two vectors (two groups of charged electrons) interact to form the resultant diagonal DB (the electrons travel ADB and CDB, coming together to behave like a single charged particle called a Weyl fermion). Tensor calculus converts the points on the sides and diagonal into a single scalar point on a nominated side (say, in the centre of the diagonal). And the mass of the vector 1 electrons minus the mass of the vector 2 electrons [($x$ MeV/$c^2$) - ($x$ MeV/$c^2$)] equals zero, and the massless Weyl.

Diagram 2 becomes identical in shape to the above parallelogram. However, this time the electrons flow in the reverse direction to the ones in “diagram 1 becomes”. They go in the BD direction, then split and follow the paths DA and DC. This preserves information if one pathway is interfered with. They produce the chargeless Majorana because the negative vector-1 electrons minus the negative vector-2 electrons equal (-y) - (-y) = 0. The Majorana’s lack of mass is attributed to the same process by which the Weyl particle becomes massless (see previous paragraph).

Why is subtraction essential? This appears to be a consequence of matter, and the Higgs boson, both emerging from photon-graviton interaction (within the context of vector-tensor-scalar geometry). Two adjoining sides of a parallelogram represent the vectors of the photon's spin 1 and the graviton's spin 2. The resultant diagonal represents the interaction of the sides/vectors (1÷2 = the spin ½ of every matter particle**:** and division is merely repeated subtraction e.g. 4 subtracted from 20 five times equals zero, therefore 20 ÷ 4 = 5). The scalar point that results is associated with a particle that only has magnitude, does not possess direction, and is associated with quantum spin 0. Should the mass produced by photon-graviton interaction be 125 GeV/$c^2$, its union with spin 0 means the Higgs boson is related to the graviton, and the Higgs field is therefore united with the gravitational field (together with the latter's constant interaction with the electromagnetic field).

To finish on a speculative note suggested by the above paragraph – if every particle in the body and brain emerges from interaction of photons and gravitons, is it possible that knowledge of this could liberate people from being a Higgs-PARTICLE-like point in space-time constantly? Could the body and consciousness also be capable of a Higgs-FIELD-like existence in which human potential expands throughout space and time to the same extent as the gravitational and electromagnetic fields whose excitations are gravitons and photons?

**REFERENCES**

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(2) Weyl, H. (1929). "Elektron und gravitation. I" - Zeitschrift für Physik - May 1929, Volume 56, Issue 5–6, pp 330–352

(3) Devin Powell, "Shape Shifters**:** An obscure mathematical field might bring about a new era in technology" - Tuesday, September 25, 2018 (http://discovermagazine.com/2018/oct/shape-shifters)