1)

74(4): Development of the Balance Condition

The balance condition in the spacetime around the magnet may be represented by:

$$\underline{T}^{(1)*} = \underline{T}^{(2)} = \underline{\nabla} \times \underline{q}^{(2)} - i\kappa\, \underline{q}^{(2)} \times \underline{q}^{(3)} \quad -(1)$$

$$= \underline{0}$$

and cyclic permutations. In eq. (1) κ has the dimensions of wavenumber and so:

$$\boxed{\kappa = \frac{1}{r}}. \quad -(2)$$

This is the ubiquitous spin connection used in paper 63 in the context of the Coulomb Law. In eq. (1):

$$\underline{q}^{(2)} = \frac{1}{\sqrt{2}}\left(-i\underline{i} + \underline{j}\right) e^{-i\phi} \quad -(3)$$

where:

$$\phi = \omega t - \kappa Z, \quad -(4)$$

and

$$\underline{q}^{(3)} = \underline{k}. \quad -(5)$$

The balance condition may therefore be thought of as a spin connection of type (2).

When the balance is broken, a net torsion vector $\underline{T}^{(2)}$ appears. This is also a spinning torsion, so the magnet spins as observed. The key question is how to break the balance condition. A

2) Simple answer is to add a spin connection:

$$\kappa_1 = \pm \frac{1}{r_1}. \quad — (6)$$

It is observed experimentally that the magnetic ensemble rotates if its design is correct. For some correct design the ensemble starts to rotate or translate. So the source of κ_1 must be the magnetic design itself. The working hypothesis is that a tiny initial input from the magnetic ~~ensem~~ assembly is amplified by resonance, causing amplification of $\underline{T}^{(2)}$ of the surrounding spacetime. This amplified $\underline{T}^{(2)}$ then acts on the magnetic assembly, causing it to spin.

The static magnetic assembly generates a torsion:

$$\underline{T}^{(2)}_{static} = \underline{\nabla} \times \underline{q}^{(2)} + \frac{i}{r_1} \underline{q}^{(2)} \times \underline{q}^{(3)}$$

$$\neq \underline{0} \quad — (6)$$

This is the usual magnetic field:

$$\underline{B}^{(2)} = A^{(0)} \underline{T}^{(2)}_{static}. \quad — (7)$$

If the field is considered to be aligned in the Z axis, then:

$$\underline{B}^{(3)} = -\frac{iA^{(0)}}{r_1}\underline{q}^{(1)} \times \underline{q}^{(2)}$$

$$= \frac{A^{(0)}}{r_1}\underline{k} \quad — (8)$$

If r_1 is averaged over 3-D space:

$$\langle r_1 \rangle = 0 \quad — (9)$$

but

$$\langle r_1^2 \rangle^{1/2} \neq 0, \quad — (10)$$

and

$$\langle \kappa_i^2 \rangle^{1/2} \neq 0 \quad — (11)$$

in eq. (6).

If it is assumed that at some critical design, $\langle \kappa_i^2 \rangle^{1/2}$ is able to ~~upset~~ break the balance condition (1) by a very small amount, then resonance can amplify this effect by a sufficient amount to cause the magnetic assembly to spin.

Rotational Symmetry of the Spacetime around the Magnet

This symmetry causes the balance, and the magnet does not rotate. This is the usual case, e.g. a bar magnet does not rotate because of its own field.

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This symmetry is:

$$\underline{\nabla} \times \underline{q}^{(1)*} = i\kappa_1 \underline{q}^{(2)} \times \underline{q}^{(3)} \quad -(12)$$

$$\underline{\nabla} \times \underline{q}^{(2)*} = i\kappa_2 \underline{q}^{(3)} \times \underline{q}^{(1)} \quad -(13)$$

$$\underline{\nabla} \times \underline{q}^{(3)*} = i\kappa_3 \underline{q}^{(1)} \times \underline{q}^{(2)} \quad -(14)$$

and may be re-expressed as a Beltrami symmetry:

$$\underline{\nabla} \times \underline{q}^{(1)} = -\kappa \underline{q}^{(1)} \quad -(15)$$

$$\underline{\nabla} \times \underline{q}^{(2)} = \kappa \underline{q}^{(2)} \quad -(16)$$

$$\underline{\nabla} \times \underline{q}^{(3)} = 0 \underline{q}^{(3)}. \quad -(17)$$

This means that:

$$\underline{\nabla} \times (\underline{\nabla} \times \underline{q}^{(1)}) = -\kappa \underline{\nabla} \times \underline{q}^{(1)} = \kappa^2 \underline{q}^{(1)} \quad -(18)$$

and so on.

Using the vector identity:

$$\underline{\nabla} \times (\underline{\nabla} \times \underline{q}^{(1)}) = \underline{\nabla}(\underline{\nabla} \cdot \underline{q}^{(1)}) - \nabla^2 \underline{q}^{(1)} \quad -(19)$$

and

$$\underline{\nabla} \cdot \underline{q}^{(1)} = 0 \quad -(20)$$

we obtain the Helmholtz wave equations:

$$(\nabla^2 + \kappa^2) \underline{q}^{(1)} = \underline{0} \quad -(21)$$

$$(\nabla^2 + \kappa^2) \underline{q}^{(2)} = \underline{0} \quad -(22)$$

$$\nabla^2 \underline{q}^{(3)} = \underline{0} \quad -(23)$$

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So the background spacetime has this symmetry and is expressible as wave equation. This means that spacetime of this ~~nature~~ symmetry is a wave spacetime.

Mechanism of Symmetry Breaking: Spin Connection Resonance (SCR)

The basis for SCR is to be found in the first Cartan structure equation (indexless notation)

$$T = d \wedge q + \omega \wedge q \quad -(24)$$

and the first Bianchi identity:

$$d \wedge T + \omega \wedge T := R \wedge q \quad -(25)$$

i.e.

$$d \wedge T := R \wedge q - \omega \wedge T := j \quad -(26)$$

Thus:

$$\boxed{d \wedge (d \wedge q + \omega \wedge q) = j} \quad -(27)$$

This is a resonance equation under certain circumstances. The most general form of the balance condition of eq. (1) is:

$$d \wedge q + \omega \wedge q = 0, \quad -(28)$$

and there is no resonance because j is zero. If the balance condition is broken, then:

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$$T = d \wedge q + \omega \wedge q \neq 0 \quad \text{--- (29)}$$

and SCR can occur. A very tiny j can result in amplification by resonance.

The working hypothesis is to assume a two stage mechanism:

1) j is induced, by the correct magnetic assembly design, in the surrounding spacetime;

2) the resonance equation (27) amplifies the Cartan torsion in spacetime to the point at which it is able to spin the magnetic assembly.

The resonance equation will be developed in note 74(5).