

# Quantum Spiral Theory

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## Abstract

*In this paper we have tried to describe a gauge group for gravitational potential associated with the elementary particle as described by their spiral structure in accordance with the standard model. It relates to the framework of quantum field theory considering the Dark Potential Waves which constitutes the Universe to be destructively interfering through Symmetry which breaks spontaneously through autocatalysis to initiate the Higgs Mechanism which consecutively defines the gravitational potential resulting in various spiral forms of particles. It also redefines the formation of Spiral Structure of Elementary Particles in context to formation of Sea Shells.*

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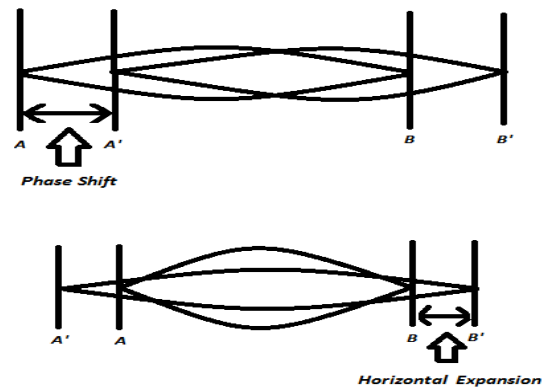
## Keywords:

Spiral; elementary particles; standard model; universe; quantum field theory ; shells.

## Introduction:

The Universe is constituted fundamentally with the Dark Potential which is the symmetric constructive and destructive interference of heat potent waves (that are unobservable ingredient of The Universe) which leaves zero potential for formation of particle in the resultant field. Unlike Quantum Field Theory where Universe is constituted fundamentally with the fields which is excited to produce the elementary particles, in Quantum Spiral Theory the elementary particles are formed through **autocatalysis** (described in later section) of these Dark Potentials

which break the symmetry either by **phase shift** or **horizontal expansion** resulting in initiation of Higgs Mechanism [2] which consecutively defines the gravitational potential resulting in various spiral forms of particles.



(Fig 1: Horizontal Displacement and vertical Phase Shift resulting in spontaneous symmetry break.)

## Defining Gauge Group for Elementary Particles with Spiral Structure:

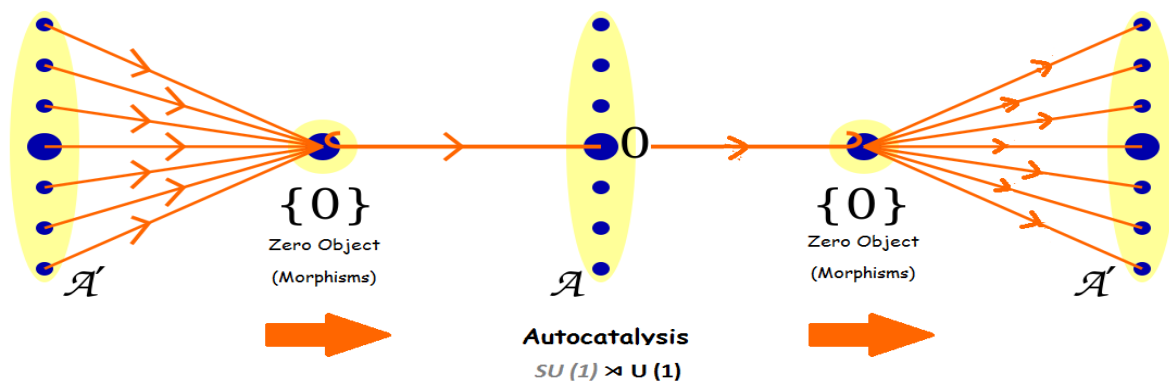
The Gauge Group of Standard model is known to be as **SU (3) X SU (2) X U (1)** which is a non-abelian symmetry gauge group. The term *gauge* refers to redundant degrees of freedom in the Lagrangian. It satisfies the description for three of the four fundamental forces named, Strong Nuclear Force, Weak Nuclear Force and Electromagnetic Force. It does not provide a description for the Gravitational Force yet. Referring to the description of Gravity in [1] and [2], we can rearrange the Gauge Group of Standard Model to include the Gravitational Force as:

$$\Rightarrow SU(3) \times SU(2) \times [SU(1) \rtimes U(1)] \dots(1)$$

$$[ \text{Since, } 1 \rightarrow SU(n) \rightarrow U(n) \rightarrow U(1) ]$$

This can be splitted as semidirect product of  $SU(n)$  and  $U(1)$  where  $U(1)$  subgroup of  $U(n)$  can be taken to consist of matrices which are diagonal and have  $e^{i\theta}$  in upper left corner and 1 on rest of diagonal. Also the  $U(n)$  is non abelian for  $n > 1$  and is infinite cyclic for all  $n$ . Thus it concludes that,

$$\Rightarrow U(1) = SU(1) \rtimes U(1) \dots(2)$$



(Fig. 2: Illustration of Autocatalysis in  $U(1) = SU(1) \rtimes U(1)$  [in the units of  $c^2$ ])

**Autocatalysis** in  $U(1)$  which is quantised in units of  $c^2$  as described in [1]. The Dark Potentials also provides short term supply of energy demanded during Boson Interaction as permitted by the Heisenberg Uncertainty Principle i.e.

$$\Rightarrow \Delta E \Delta t \geq \frac{1}{2} \hbar \dots(3)$$

The borrowed energy after the usage or interaction annihilates by destroying the potential through destructive interference and loosing back the potential to the Overall Dark Potential i.e. unobservable ingredient of The Universe.

The Overall Dark Potential term of Gauge Group goes along in all its subgroups as it is required for **autocatalysis**. For example, during Higgs Mechanism when the Gauge Group of Standard Model decay into  $SU$

$SU(1)$  is trivial group having only a single element. There are isomorphic of cyclic order 1. The trivial group serves as the zero objects in category of groups, meaning it behaves as both initial and terminal object. In our model of Quantum Spiral Theory,  $SU(1)$  represents the Overall Dark Potentials of the Universe from which the Energy is being borrowed in account of available potential for formation of Spiral Structure for Elementary Particles through the semidirect product with  $U(1)$ . Equation (2) describes the phenomenon of

$SU(3) \times U(1)$ , the  $U(1)$  preserves its **autocatalytic** behaviour and the respective Gauge Group can be viewed as  $SU(3) \times [SU(1) \rtimes U(1)]$ .

**Note: The Quantum Spiral Theory keeps the Gauge Group and Lagrangian of Standard Model conserved. It only integrates the autocatalysis definition in the existing Standard Model to incorporate the gravitational potential as defined by the Spiral Structure of Elementary Particles.**

**Redefining the formation of Spiral Structure of Elementary Particles in context to formation of Sea Shells:**

Taking the Spiral Structure of Elementary Particles in analogous to the **self-similar** Sea Shells, we can derive its structure and pigmentation pattern which for Elementary Particles combines together to

form an initial structure with intrinsic behaviours and extrinsic interaction with other particles. Initially the particle is expected to have inwardly rotating **Nautilus** shape while during acceleration it attains the various **conical** shapes.

**Reaction – Diffusion** model of pigmentation patterns provide the key of intrinsic property deposited on the **tip** of the Spiral Structure of Elementary Particle which diffuses inwardly to the whole of spiral structure. (It's in context to the deposition of pigmentation pattern on the growing edge of shells)

Pickover approximated shell surfaces using interpenetrated spheres, placed at carefully chosen distances from each other and rendered using periodically altering potential waves creates the appearance of ribbed surface with stripes. In comparison to the Spiral Structure of Elementary Particles, the approximation describes the discrete behaviour of Elementary Particles to be consequence of interpenetration of constituent dark potential waves of associated elementary particle at **sub-scales (i.e. the interfering waves at smaller scale which provides the final resultant potential waveform required for creating the Spiral Structure of Elementary Particle)** which is being rendered externally using periodically altering potential waves at **super-scale (i.e. the waves enveloping the final resultant potential waveform which is creating the Spiral Structure of Elementary Particle)**.

It can now be described by short range **activation** and long range **inhibition** in **Fernet Frame** by incorporating Generating Curve. The Fernet Frame is not defined in points with Zero Curvature as in context to Space-Time Canvas, zero curvature does not hold **mass** i.e. it lacks gravitational potential.

Reaction Diffusion equation operates in discretized uniform space provided by the initial potential wave form during formation of Spiral Structure for Elementary Particle. This provides following mathematical viewpoints:

$$\Rightarrow L = \int_{S_{min}}^{S_{max}} \sqrt{\left(\frac{du}{ds}\right)^2 + \left(\frac{dv}{ds}\right)^2 + \left(\frac{dw}{ds}\right)^2} ds$$

$$\Rightarrow \frac{ds}{dl} = \frac{1}{f(s)}$$

The total length of resulting spiral is given by  $L$ . Where  $C(s) = (u(s), v(s), w(s))$  denote a parametric definition of the spiral's curve with  $s \in [S_{min}, S_{max}]$ .

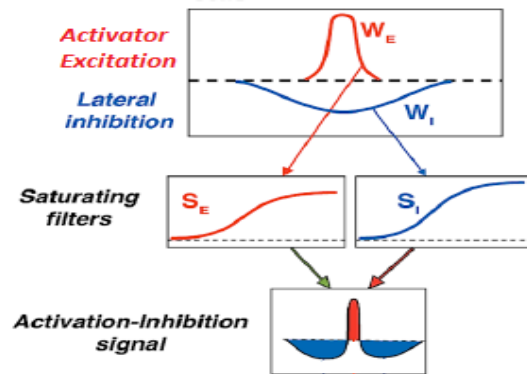
Diversity in pattern of Particle Family is attributed to the lack of selective value of any particular pattern. The potential deposition for behaviour or interaction is under the control of waveform called **activator**, which simulates its own production through a positive feedback mechanism called **autocatalysis**. **Inhibitors** are waveforms that suppress the production of the activator in neighbourhood of **autocatalytic centre**. Production of activator is autocatalytic process proportional to  $c^2$ . The autocatalysis can saturate at higher activator concentrations at level controlled by the **super-scale** potential waves. Initially **Vacuum Expectation Value (VEV) (i.e. the minimum of potential V (Φ) in the lagrangian of scalar potential)** represents a small base production of activator waves needed to initiate the autocatalytic process for formation of Spirals of Elementary Particles. This **VEV** is provided by the potential created through the spontaneous break in the symmetry of Universe which itself is consequence of autocatalytic process in Dark Potentials.

**Note: The autocatalytic process in Dark Potential is independent of the**

**autocatalytic process required for formation of Spiral Structure for Elementary Particles and it does not require VEV to be initiated but is ever running process along with the interferences of Dark Potential Waves.**

Propagation of colliding waves is a major feature of neutral Universe as a whole. Previously colliding waves extinguishes each other. But after spontaneous symmetry break with **VEV**, an activated point of one wave spontaneously initiates another wave travelling in opposite direction. The Overall Dark Potential of the Universe is the global control mechanism that monitors the total amount of activator in the system and initiates new waves when its concentration becomes too low.

The **activator** catalyses the production of its antagonist **inhibitors** which in turns decreases the production of activator proportionally. A small number of travelling wave yields a small concentration of catalysing which accelerates the decay of inhibitors. The concentration of activator increases and at some points reaches the threshold at which **additional activator waves** are formed resulting in multiple behaviours of single particle. E.g. **Quarks**. It's a self regulating process, where the catalysing which accelerates the decay of inhibitors provides a negative feedback maintaining the number of travelling waves at an approximately constant level.



(Fig 3: Illustration of Activator – Inhibition Phenomenon.)

Reaction Diffusion is not a single model, but the corner stone of a whole spectrum of models, differing in numbers & characteristics of ready substances.

Also it needs to be noted that **Fermions** can't have a non-zero **VEV**. It's because since the components of Universe requires to satisfy the Lorentz Invariance to have Uniform Global Behaviours. If the Lorentz Invariance is broken for **Fermions**, the particle would be locked in the localised potential and can't freely travel in space unlike galaxies or planets which are locked in dynamics of localised potential system.

**Conclusion:**

The rearranged Gauge Group of Standard Model incorporating the gravitational behaviour provides an insight in to the Unified Nature of Universe where the trivial group of **SU (1)** provides the initial state for Formation of Universe and it also provides the terminal state for End of Universe. The Sea Shell analogous descriptions of Spiral Structure of Elementary Particles help us to describe more complex behaviour of particles and also the discrete quantization of its interaction through activator-inhibitor model.

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