Explanation of Model G in Subquantum Kinetics

Brendan J. Darrer and Paul A. LaViolette

***Abstract*—This paper is an introduction to subquantum kinetics (SQK), specifically for those scientists less familiar with the hypothesis. It explores the physics principles behind the terms in the subquatum kinetics Model G equation system, and mainly consists of sections extracted from the first part of the book “Subquantum Kinetics —A Systems Approach to Physics and Cosmology” by Paul A. LaViolette, Ph.D. (2012) [1].**

***Index Terms*—Subquantum kinetics, nonlinearity, reaction-diffusion, Brusselator.**

I. INTRODUCTION - PROCESS & ORDER

“In contrast to the conventional paradigm, the methodology presented here, henceforth referred to as subquantum kinetics, conceives process, not structure, to be the basis of physical existence. This new approach to physics postulates an active, interactive subquantum substrate whose processes give birth to and continually sustain the physical form that makes up our universe.

Subquantum kinetics is a novel microphysics paradigm that incorporates open system concepts previously developed in the fields of general system theory and nonequilibrium thermodynamics.” [2]

So we are treating nature and subatomic particles as open systems, which leads to a very different interpretation and mathematical description of the same phenomena that conventional physics deals with.

“Instead of beginning with physical observations, subquantum kinetics instead begins by postulating a set of well-ordered reaction and diffusion processes theorized to take place at the subquantum level among entities called etherons. These etheric components, which are present in various types, collectively compose what is termed the transmuting ether, a set of etheric substrates that are continuously active and hence quite different from the passive mechanical ethers considered in the eighteenth and nineteenth centuries.” [3]

“In choosing an adequate model to represent subquantum processes, we turn to the macroscopic natural world, to theories describing how certain open reaction systems spontaneously evolve well-ordered wave patterns. This field of investigation was pioneered in 1952 by Alan Turing. Turing was searching for an explanation for the symmetry-breaking stage of embryonic development in which an initially uniform array of identical cells making up a zygote begins to differentiate and after further differentiation eventually leads to the development of specialized organs. Examining the general case of a nonlinear reaction-diffusion system involving competing activator and inhibitor species, both free to diffuse through space, he demonstrated that under certain conditions an initially homogeneous chemical system of this sort could become unstable such that its species would spontaneously self-organize to produce a spatial concentration pattern. This type of self-organization phenomenon has since come to be known as a Turing instability.” [3], [4]

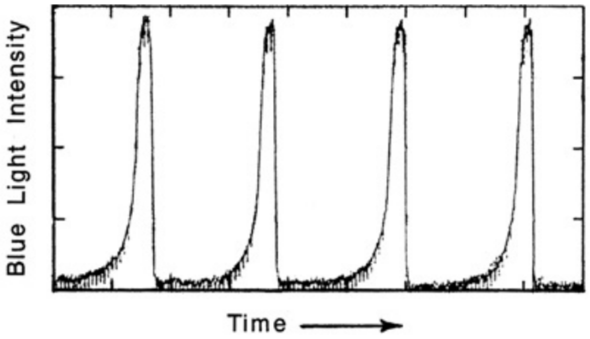

Fig. 1. Chemical clock oscillations in Belousov-Zhabotinskii reaction made visible as color changes when the dye indicator ferroin is added to the solution. [3]

“Six years later Belousov discovered that a solution containing bromate ions, malonic acid, sulfuric acid, and a small amount of cerous ions will spontaneously oscillate; see Figure 1. In 1970, Zhabotinskii and Zaikin reported that a modified version of this reagent (Figure 2) would produce slowly moving concentration fronts called chemical waves. These reaction-diffusion waves were made visible as changes in color (between red and blue) when the oxidation-reduction indicator ferroin was added to the reacting solution; see Figure 3. Such patterns are sometimes termed Turing patterns in recognition of Turing who first predicted their existence. The work of Zaikin and Zhabotinskii subsequently inspired many experimenters to pursue work on chemical wave phenomena.” [3], [5]–[8]

“Turing’s work became better known in 1967 when a group at Brussels University began publishing a series of theoretical papers on spatial instability in homogeneous chemical systems. Their early theoretical work focused mainly on a reaction kinetic model known as the Brusselator (Figure 4). This two-variable model holds the distinction in the field of reaction-kinetics of being an archetypal reaction-kinetic oscillator, comparable in simplicity to the simple harmonic oscillator of wave mechanics. That is, *it is the simplest reaction system known to produce wave patterns that have well-defined wavelength properties*; see Figure 5.” [3], [9]–[12]

Corresponding authors: B. J. Darrer (email: brendan.darrer.12@ucl.ac.uk) and P. A. LaViolette (email: ethericgate@gmail.com).

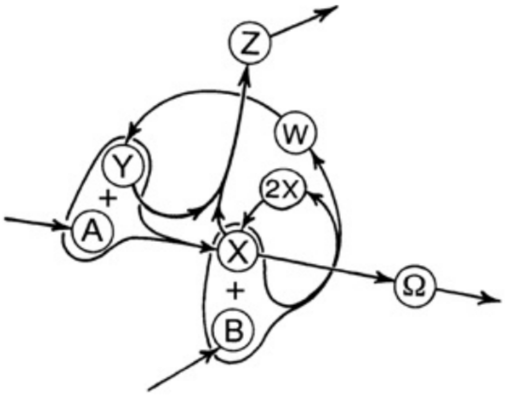

Fig. 2. A simplified representation of the B-Z reaction pathways. This theoretical model, known as the Oregonator, was developed by chemists at the University of Oregon. [3]

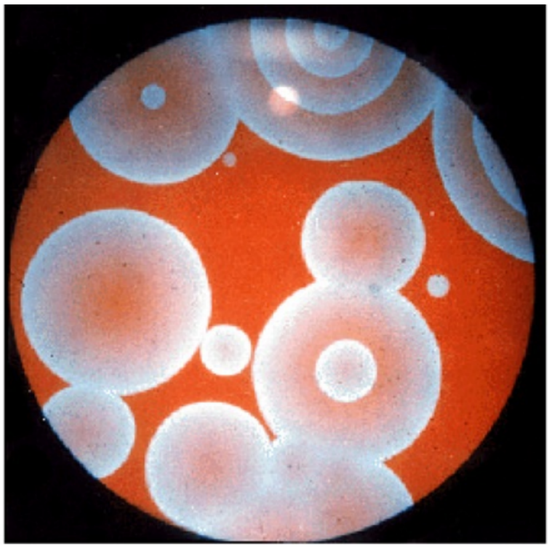

Fig. 3. Chemical waves in the Belousov-Zhabotinskii reaction. The reaction has turned red in the darker regions and light blue in the lighter regions. [3]

II. REACTIVE BEHAVIOUR

“As constituents of the ether, etherons play a role which is analogous to that of atoms and molecules in chemical reaction systems, or analogous to neutrons and fissionable atoms in a nuclear reactor. As a result of their random motion, etherons have a certain probability of colliding with one another and subsequently of interacting. If the collision involves the right combination of etheron types, a transformation could occur such that at least one of the etheron’s changes from being one species into being another. An example of such a multi-etheron interaction is diagrammed in Figure 6(a). Alternatively, an etheron may spontaneously change its form from being configured as one species into being configured as another without interacting or colliding with another etheron, as shown in Figure 6(b).

Etheron species that serve as inputs to a transformation are called reactants, while species yielded as outputs from a

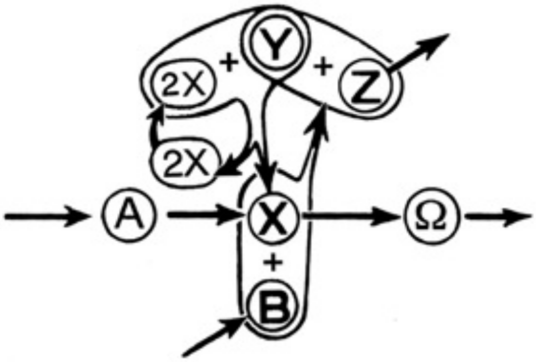

Fig. 4. A schematic of the Brusselator reaction pathways. [3]

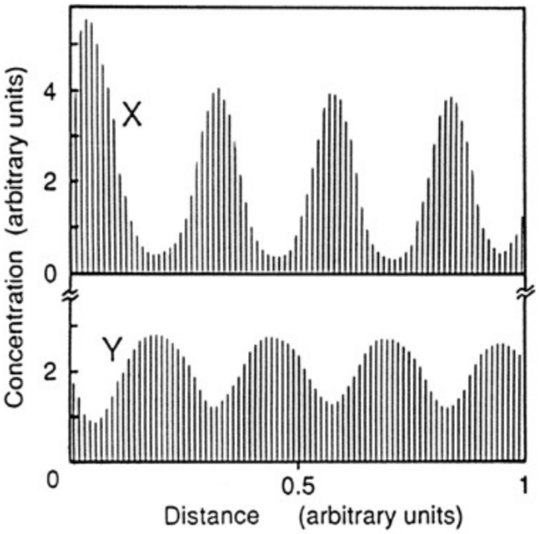

Fig. 5. Computer simulation of a nonlocalized stationary concentration wave generated by the Brusselator reaction in a one-dimensional reaction volume. [3]

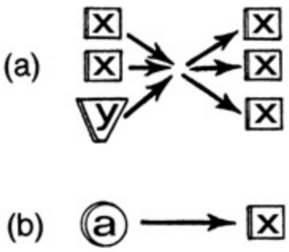

Fig. 6. Examples of subquantum reactions: a) a multi-etheron interaction, b) a solitary transformation. [13]

transformation are called products. The terms reactants and products are more often used to refer to the ether substrates, rather than to their etheron constituents since this reaction-kinetic approach usually employs a macroscopic, collective description of these processes." [13]

III. ETHER KINETIC EQUATIONS

"Etherons react with one another along certain preferred pathways. A given reaction may be represented by a kinetic equation, such as is customarily used in chemical kinetics, which specifies the manner in which a set of reactants transform into products. For example, the autocatalytic reaction illustrated in Figure 6(a) may be written as:

$$2\,\mathrm{X} + \mathrm{Y} \underset{\mathrm{k}_{-3}}{\overset{\mathrm{k}_3}{\rightleftharpoons}} 3\,\mathrm{X} \tag{1}$$

where X and Y represent the concentration values of the X and Y substrates and where k_3 and k_{-3} represent the forward and reverse reaction rate constants, or kinetic constants, for this transformation.[1]

Such equations are often called "state equations" because they describe how the constituent elements change from one state or form into another. A set of such equations would be used to specify the ether reactions that produce our physical universe. In chemistry, the kinetic constants k_i are determined by factors such as the molecular collision frequency, enthalpy of activation, and entropy of activation. In subquantum kinetics, the kinetic constants would be determined by analogous properties attributable to etheron interactions. The values for these constants would be chosen with the aim of making the ether reaction model realistic. That is, the concentration patterns spontaneously emerging from the ether should produce structures (subatomic particles and photons) that correspond with observation.

In subquantum kinetics, etheron concentrations and their reaction and diffusion rates are measured in the absolute reference frame. The reactions considered are of the irreversible kind in which forward reactions predominate over reverse reactions. For example, in Reaction (1), k_3 would be much larger than k_{-3}. Expressed in differential form, this reaction would be written as:

$$R_X = \frac{d\mathrm{X}}{dt} = k_3\mathrm{X}^2\mathrm{Y} - k_{-3}\mathrm{X}^3 \tag{2}$$

where R_X specifies the rate of change of the concentration of product X in terms of values of the concentrations of the reactants X and Y and the rate constants k_3 and k_{-3}." [14]

IV. ETHERIC FORCE: THE PRIME MOVER

"Etheric Force characterizes the tendency for a nonequilibrium ether reaction to proceed forward. Its magnitude depends on both the reactant concentrations and the value of the kinetic constants. For example, in Eq. (2) an increase in either X, Y, or k_3 would increase the etheric Force of this reaction. This, in turn, would increase the etheric flux; i.e., the rate R_X at which X is produced from Y. In effect, etheric Force is the Prime Mover of the ether and of the universe. All material form and activity that arises from the ether owes its existence to etheric Force. The etheric Force concept is modeled after a similar concept employed in the discipline of chemical kinetics where reaction "force" there signifies the tendency for a nonequilibrium chemical reaction to proceed forward, force being dependent on the concentrations of the chemical reactants and on the values of their forward kinetic constants. Here we capitalize etheric "Force" to distinguish it from the more familiar concept of physical force, which is experienced in pushing an object and which occurs when an energy potential gradient accelerates a material body; see Section 2.9.5 [of the SQK book]." [1], [15]

V. DIFFUSIVE BEHAVIOR

"Besides reactively transforming from one type into another, etherons also move in space. Like molecules in a gas or liquid, etherons exist in a state of random motion continually colliding with one another. Due to their "Brownian motion," they have a tendency to diffuse from regions of high to low concentration. Just as with molecules, at a given point in space the direction and rate of diffusion of etherons of a given type depends on the direction and steepness of the slope in the prevailing concentration of those etherons. The steeper the concentration gradient, the more rapidly etherons will diffuse down the gradient. This is an example of the Second Law of Thermodynamics at work in nature. Etheron diffusion behavior may be mathematically represented as follows. Let the vector $\mathrm{C}_i(r)$ represent the gradient of the concentration C_i of specie i at a given point in space, that is, the change in its concentration as a function of distance r. The rate of flow of etherons through a unit of surface area disposed perpendicular to this concentration gradient is denoted as the diffusive flux vector, $\mathbf{\Phi}_i(r)$. Adopting Fick's law for molecular diffusion, we postulate that the magnitude of $\mathbf{\Phi}_i(r)$ varies in direct proportion to the concentration gradient as:

$$\mathbf{\Phi}_i(r) = -D_i \boldsymbol{\nabla}\mathrm{C}_i(r) \tag{3}$$

where D_i is a constant of proportionality called the diffusion coefficient. To calculate the etheron flux in a relative frame of reference in which the ether has a net velocity, $\boldsymbol{v}$, the convective flux vector, $\boldsymbol{v}\mathrm{C}_i(r)$, must also be taken into account, giving a total flux of:

$$\boldsymbol{J}_i(r) = -D_i \boldsymbol{\nabla}\mathrm{C}_i(r) + \boldsymbol{v}\mathrm{C}_i(r) \tag{4}$$

Depending on the direction of C_i relative to $\boldsymbol{v}$, these two effects could be either complementary or competitive." [16]

VI. ETHERON CONSERVATION

"Earlier (Section 2.1 of the SQK book [1]), we noted that etherons are conserved. That is, any change in the number of type-i etherons must be accounted for either by the import or export of type-i etherons from that volume or by the birth

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[1] Ether concentration is analogous to field potential. The concentration of a substrate is a scalar quantity that is expressed in general mathematical form as: $\mathrm{C}_i = d\mathrm{n}_i/d\mathrm{V}$, where $d\mathrm{n}_i$ is the number of etherons of an arbitrary substrate, type-i, contained in an incremental volume of space $d\mathrm{V}_{absolute}$, measured in the absolute reference frame.

or death of type-i etherons through reactive transformation. To mathematically represent this accounting process we must first define a scalar quantity called the net diffusive flux S_i which represents the rate at which type-i etherons flow into or out of a given incremental volume through the surface bounding that volume. This rate is expressed as the divergence of the etheron flux vector, $\boldsymbol{\Phi}_i$:

$$\mathrm{S}_i = \boldsymbol{\nabla}\boldsymbol{\Phi}_i(r) = -D_i\nabla^2\mathrm{C}_i(r) \tag{5}$$

For a relative reference frame, the above relation should be expanded to include the divergence of the convective flux:

$$\mathrm{S}_i = -D_i\nabla^2\mathrm{C}_i(r) + \boldsymbol{v}\cdot\boldsymbol{\nabla}\mathrm{C}_i(r) \tag{6}$$

However, for many of the situations we will be considering, we may assume $\boldsymbol{v} = 0$ and neglect this second term.

The etheron conservation requirement may now be mathematically expressed as:

$$\frac{\partial \mathrm{C}_i}{\partial t} = R_i(\mathrm{C}_1, \mathrm{C}_2, \mathrm{C}_3, ..., \mathrm{C}_n) - \mathrm{S}_i(\mathrm{C}_i) \tag{7}$$

where $\partial\mathrm{C}_i/\partial t$ is the net rate of change in the concentration of type-i etherons within a given incremental volume $d\mathrm{V}$ in the absolute rest frame and within a given increment of absolute time dt, R_i is the net rate of generation of type-i etherons due to etheron reactions taking place within $d\mathrm{V}$, and S_i is the net diffusive flux of type-i etherons flowing out of $d\mathrm{V}$ (or into $d\mathrm{V}$) during time dt." [17]

Definitions used in above equations

Etherons are quantified by concentration $\mathrm{C}_i(r)$.

$\boldsymbol{J}_i(r)$ is the total diffusive flux vector, and denotes the number of etherons of type i per unit area per unit time.

$\boldsymbol{\Phi}_i(r)$ is the diffusive flux vector, and denotes the number of etherons of type i that will flow through a unit area during a unit time interval.

D_i is the diffusion coefficient or diffusivity for etheron type i. It is the proportionality between the flux of specie i driven by the concentration gradient for specie i. It is expressed in units of area per unit time.

$\mathrm{C}_i(r)$ represents the concentration of etherons of type i (e.g. A, B, X, Y, G, Z or Ω), and denotes the number of etherons per unit volume.

r is position, the dimension of which is length.

$\mathrm{S}_i(r)$ is the net diffusive flux, and denotes the number of etherons of type i per unit volume per unit time.

k_i is the reaction rate constant which is typically the number of etherons reacting per unit time.

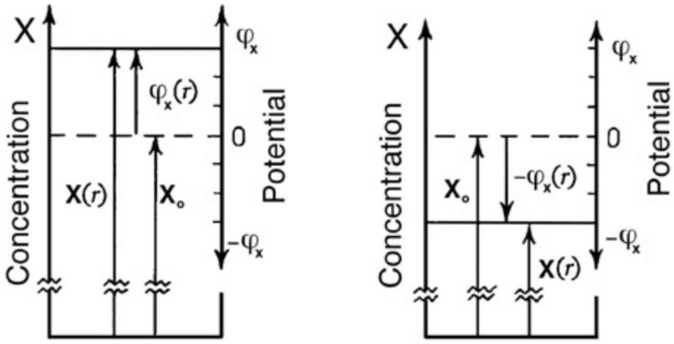

Fig. 7. The relation of an ether substrate potential ϕ_X to its corresponding etheron concentration. [18]

VII. ETHER SUBSTRATE FIELDS AND FIELD POTENTIAL

"There is a one-to-one correspondence between ether concentration and the concept of field potential used in quantum theory. To clarify this correspondence, we define a quantity called the ether substrate potential ϕ_i which is the difference between a specie's actual concentration and its homogeneous steady-state concentration, e.g., $\phi_X(r,t) = \mathrm{X}(r,t) - \mathrm{X}_0$ (see Figure 7). Ether substrate potential would be the correlate of field potential. As noted further on, subquantum kinetics identifies ϕ_X and ϕ_Y with electrostatic field potential, both X and Y etheron components being necessary for the production of an electric field. Also subquantum kinetics identifies ϕ_g with gravitational field potential. Whereas ether concentration is always a positive quantity, field potential (or ether substrate potential) may adopt positive as well as negative values from a given zero point reference. As noted above, we may set the zero point for the field potential of a given etheron specie equal to the homogeneous steady state concentration value for that specie at an arbitrary point in space.

The scalar ether potential fields of subquantum kinetics resemble the quantum mechanical view which regards field potentials as real physical quantities. This differs from the standard classical physics concept which regards field potentials (potential energy per unit charge or per unit mass) as mere mathematical quantities that are assigned to a spatial continuum and are used to calculate the amount of work required to move a mass or charge from one point in space to another. As noted below, Gauss and Weber viewed potential fields more in line with the modern quantum mechanical view as being the actuators of force. The magnitudes of the ether substrate potential fields are assumed to be much smaller than the values of their respective substrate concentrations; i.e., $|\phi_X| \ll \mathrm{X}$, $|\phi_X| \ll \mathrm{Y}$, etc. This would allow superimposed field potentials to be totaled in additive fashion according to the principle of linear superposition." [18]

VIII. MODEL G —TOWARD A UNIFIED FIELD THEORY

"Contemporary field theory finds its roots in the 18th and 19th century mechanical ether theories. Those theories conceived force fields to be states of stress in an underlying ether substance. While material particles were acknowledged as the sources of fields, there was no theory then available that would explain how particles generated their fields. The force field phenomenon was simply regarded as a fact of nature, one that was supported by laboratory experiment. Particles were assigned attributes such as "mass" and "charge" with no attempt being made to delve further than this. Contributing to this conceptual split between the fields, on the one hand, and the producers of the fields (particles), on the other, was the practice of regarding material particles as being physically isolated from the ether. Matter was viewed as being surrounded by the ether in much the same way that stones lying in a pool would be surrounded by their water medium. Thus an inherent dualism became structured into early field theory. Namely, particles were understood as the source of force fields, yet they were at the same time considered to be separate from those fields. Although the ether theory was abandoned at the start of the last century, the force field concept was retained together with the mechanistic framework in which it was couched. Consequently, this "field/ source dualism" became transplanted into contemporary physics.

This dualistic framework has proven distasteful to theoreticians seeking to construct unitary descriptions of physical phenomena. For example, this fragmentation of physical theory was noted by Einstein who wrote:

> *In Newtonian physics the elementary theoretical concept on which the theoretical description of material bodies is based is the material point, or particle. Thus matter is considered a priori to be discontinuous... But when, in the second half of the 19th century, the laws of electrodynamics became known, it turned out that these laws could not be satisfactorily incorporated into the Newtonian system. ...The introduction of the field as an elementary concept gave rise to an inconsistency of the theory [of electrodynamics] as a whole. Maxwell's theory, although adequately describing the behavior of electrically charged particles in their interaction with one another, does not explain the behavior of electrical densities, i.e., it does not provide a theory of the particles themselves. They must therefore be treated as mass points on the basis of the old theory [Newtonian physics]. The combination of the idea of a continuous field with that of material points discontinuous in space appears inconsistent.* [19]

Einstein believed that the physical reality of space would be best represented by a continuous field and that all physical phenomena, including particles, could be described by the appropriate solutions to the equations representing this field. He spent many years attempting to modify his general relativity theory into a form that might yield such a unified field theory that would embrace gravitating masses as well as electrodynamic interactions, but was unable to attain a workable formulation. As shown here, it may be possible to realize the long sought goal of a unitary field theory by working within the fertile framework of subquantum kinetics. However, the reactive ethers of subquantum kinetics generate fields that have a very different character from the fields of classical physics. That is, the subquantum kinetics fields are energy potentials (concentration nonuniformities) that exist as a direct result of nonequilibrium reaction and diffusion processes continually taking place in the underlying ether. So subquantum kinetics embarks on its unified field theory approach from a point of departure quite different from that taken in the past.

The next few chapters (sections and chapters following Section 3.1 in the SQK book [1]) investigate one particular prototype subquantum kinetics ether reaction scheme called "Model G," whose behavior appears to adequately reproduce many properties characteristic of quantum structures. [20], [21] As mentioned in Chapter 1 [of the SQK book], Model G is similar to the two-variable Brusselator reaction system, but has been modified into a three-variable system through the addition of a third variable, G, whose significance is described in Section 3.2. Model G is able to generate propagating reaction-diffusion waves as well as stationary field patterns. Thus Model G leads to a unitary description of quantum structures that has the potential of describing both waves and particles. Subatomic particles are not postulated ad hoc, as they are in classical microphysics, but rather emerge as corollaries of, or solutions to, the basic set of reaction-diffusion equations that serve as a description of space. Moreover these particle-like field patterns (or dissipative structures) have the feature that they are continuous with their field environment and thus avoid the field/source dualism problem that plagues contemporary theory. In fact, these localized field patterns closely fit the "bunched field" description that Einstein had in mind.

As will be demonstrated, the particle-like structures that Model G generates are not only autonomous, self-stabilizing entities, they also generate their own long-range potential fields capable of producing gravitational and electrostatic force field effects. Section 3.2 describes some features of this novel reaction-diffusion system model." [22]

IX. The Reaction Scheme

"Model G is a nonequilibrium, nonlinear ether reaction scheme that is specified by the following five kinetic equations which represent ether reactions that take place among various etheron constituents:

$$\mathrm{A} \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} \mathrm{G} \tag{8a}$$

$$\mathrm{G} \underset{k_{-2}}{\overset{k_2}{\rightleftharpoons}} \mathrm{X} \tag{8b}$$

$$\mathrm{B} + \mathrm{X} \underset{k_{-3}}{\overset{k_3}{\rightleftharpoons}} \mathrm{Y} + \mathrm{Z} \tag{8c}$$

$$2\,\mathrm{X} + \mathrm{Y} \underset{k_{-4}}{\overset{k_4}{\rightleftharpoons}} 3\,\mathrm{X} \tag{8d}$$

$$\mathrm{X} \underset{k_{-5}}{\overset{k_5}{\rightleftharpoons}} \Omega \tag{8e}$$

Letter symbols A and B denote the concentrations of the initial ether reactants; G, X, and Y denote the concentrations of the intermediate reactants; and Z and Ω denote the concentrations of the final reaction products. The forward reaction rate constants, k_i, above each arrow, and the reverse reaction

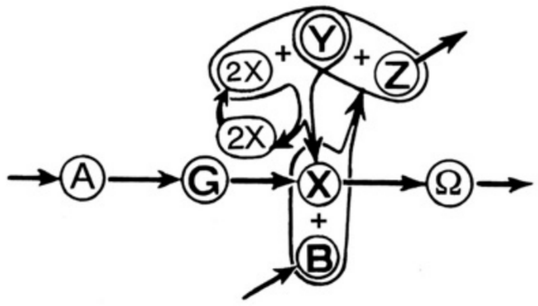

Fig. 8. A schematic representation of the reaction kinetics of Model G. [23]

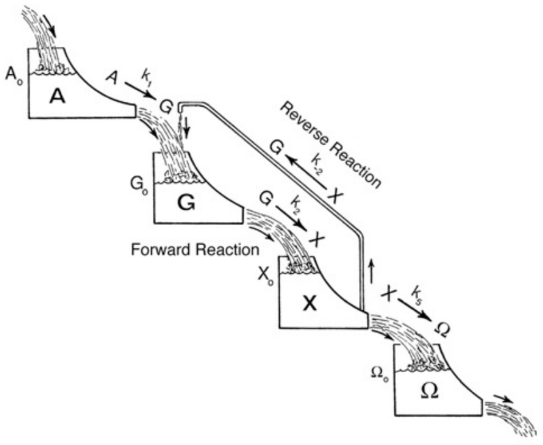

Fig. 9. A hydrodynamic analog of some of Model G's reactions; see equations 8a, 8b and 8c. [23]

rate constants, k_{-i}, below each arrow specify the rate at which reactants (back of arrow) transform into products (front of arrow). As described in Chapter 2, Section 2.5 [of the SQK book], all reverse reaction rates are assumed to be very small in comparison with the forward rates, i.e., $k_{-i} \ll k_i$, implying that the reaction scheme as a whole is essentially irreversible and operates far from thermodynamic equilibrium. Such reaction systems are distinguished from those whose reactions are allowed to reach equilibrium with the forward and reverse reaction rates just balancing one another. The reverse reaction rate in Reaction (8b), however, is set sufficiently large as to produce a feedback that allows this system to generate localized dissipative space structures. The other reverse reaction rates may be assumed to be essentially zero. The main forward reactions may be collectively diagrammed as shown in Figure 8.

Making a hydrodynamic analogy, the specified etheron concentrations might be thought of as fluid levels in a sequence of reservoirs, while the reaction rate constants might be thought of as exit orifices having specific diameters that protrude from each reservoir (see Figure 9). Thus the product of both the reactant concentration (fluid level) and rate constant (orifice diameter) would determine the transformation rate (output flow rate). The only reverse reaction shown here, $\mathrm{G} \xleftarrow{k_{-2}} \mathrm{X}$, is illustrated by the small overhead pipe pumping water from reservoir X back into reservoir G.

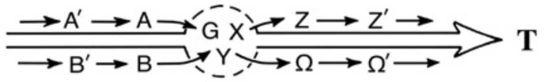

Fig. 10. A suggested expansion of the Model G ether reaction scheme as it would appear disposed along dimension **T**. G, X and Y mark the domain of the physical universe. [23]

Model G's nonequilibrium state may be maintained indefinitely provided that etherons are continually supplied to states A and B and are continually removed from states Z and Ω, perhaps through further transformation. The "source" substrates A and B and the "sink" substrates Z and Ω are assumed to be homogeneously distributed in space and time and to have relatively constant concentrations. That is, as a first approximation, the etherons in these initial and final states are assumed to have very high diffusion rates; i.e., they are characterized by very large diffusion rate coefficients. No such restrictions are placed on the reaction intermediates G, X, and Y, which are allowed to vary over space and time. The matter and energy of our observable universe would consist of concentration variations in these three ether media.

The two global irreversible reaction pathways, $\mathrm{A} \longrightarrow \Omega$ and $\mathrm{B} \longrightarrow \mathrm{Z}$, may be envisioned as taking place along a fourth dimension of space, termed the "transformation dimension," and symbolized in Figure 10 by vector **T**. All energy potentials (ether concentration inhomogeneities) forming the matter and energy constituents of our physical universe would be sustained by this ongoing etheric flux. This flux essentially passes "through" our physical universe along the transformation dimension. Thus subquantum kinetics conceives our physical universe to be an open system whose continued existence depends on the unceasing operation of its underlying reaction processes." [23], [24]

"Let us now return to Model G. Based on Model G's reaction kinetic scheme, Equation System 8a through 8e, we may write the following set of partial differential equations [26] to depict how reaction intermediate variables G, X, and Y vary as a function of space and time:

$$\frac{\partial \mathrm{G}(x,y,z,t)}{\partial t} = D_G \nabla^2 \mathrm{G} - (k_{-1} + k_2)\mathrm{G} + k_{-2}\mathrm{X} + k_1 \mathrm{A} \quad \text{(9a)}$$

$$\begin{aligned} \frac{\partial \mathrm{X}(x,y,z,t)}{\partial t} &= D_X \nabla^2 \mathrm{X} + k_2 \mathrm{G} - (k_{-2} + k_3 \mathrm{B} + k_5)\mathrm{X} \\ &\quad + k_{-3}\mathrm{ZY} - k_{-4}\mathrm{X}^3 + k_4 \mathrm{X}^2\mathrm{Y} + k_{-5}\Omega \end{aligned} \quad \text{(9b)}$$

$$\frac{\partial \mathrm{Y}(x,y,z,t)}{\partial t} = D_Y \nabla^2 \mathrm{Y} + k_3 \mathrm{BX} - k_{-3}\mathrm{ZY} + k_{-4}\mathrm{X}^3 - k_4 \mathrm{X}^2\mathrm{Y} \quad \text{(9c)}$$

Here we follow the same mathematical protocol that was used in previous sections to derive Relations (2), (6) and (7)." [23]

The simulation that results when these equations are solved in 1 dimension (with 3D symmetry) is shown in

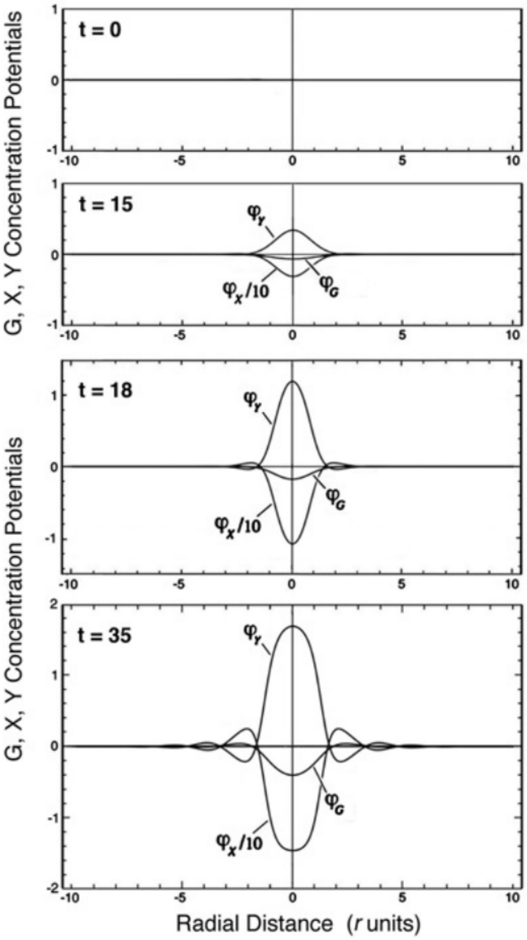

Fig. 11. Sequential frames from a three-dimensional (3D symmetry in 1D) computer simulation of Model G showing the emergence of an autonomous dissipative soliton particle: t = 0 the initial steady state; t = 15 growth of the positively charged core as the X seed fluctuation fades; t = 18 deployment of the periodic electric field Turing wave pattern; and t = 35 the mature dissipative soliton particle maintaining its own supercritical core G-well. Simulation by M. Pulver.

Figure 11, [25] which are a series of still shots taken from a simulation by Matt Pulver; see Pulver and LaViolette [26] for more information. One such simulation may be viewed at: http://youtu.be/gomgylLOIyg.

Remembering Eq. (7):

$$\frac{\partial \mathrm{C}_i}{\partial t} = R_i(\mathrm{C}_1, \mathrm{C}_2, \mathrm{C}_3, ..., \mathrm{C}_n) - \mathrm{S}_i(\mathrm{C}_i)$$

where, R_i is the net rate of generation of type-i etherons (X, Y, G, A, B, Z, and Ω) due to etheron reactions taking place within $d\mathrm{V}$, and where S_i is the net diffusive flux of type-i etherons (G, X, and Y) flowing out of $d\mathrm{V}$ (or into $d\mathrm{V}$) during time dt.

Looking at the kinetic reaction terms of these equations (9a through 9c above) we see that it is describing reaction system (8).

$$\mathrm{A} \xrightleftharpoons[\mathrm{k}_{-1}]{\mathrm{k}_1} \mathrm{G} \qquad \mathrm{G} \xrightleftharpoons[\mathrm{k}_{-2}]{\mathrm{k}_2} \mathrm{X} \qquad \mathrm{B} + \mathrm{X} \xrightleftharpoons[\mathrm{k}_{-3}]{\mathrm{k}_3} \mathrm{Y} + \mathrm{Z}$$

$$2\,\mathrm{X} + \mathrm{Y} \xrightleftharpoons[\mathrm{k}_{-4}]{\mathrm{k}_4} 3\,\mathrm{X} \qquad \mathrm{X} \xrightleftharpoons[\mathrm{k}_{-5}]{\mathrm{k}_5} \Omega$$

Eq. (9a) makes use of reactions (8a) and (8b) and describes the net diffusive flux of G etherons, $D_G \nabla^2 \mathrm{G}(r)$, and the kinetic reactions of A, G and X using reaction rate constants k_1, k_{-1}, k_2 and k_{-2} that have units of per unit time (eg. s^{-1}).

Eq. (9b) makes use of reactions (8b) through (8e). It describes the net diffusive flux of X etherons, $D_X \nabla^2 \mathrm{X}(r)$, and the kinetic reactions of G, B, X, Z, Y, Z and Ω, using reaction rate constants k_2, k_{-2} in units of inverse time.

Eq. (9c) makes use of reactions (8c) and (8d). It describes the net diffusive flux of Y etherons, $D_Y \nabla^2 \mathrm{Y}(r)$, and the kinetic reactions of B, X, Z and Y, using reaction rate constants k_3, k_{-3}, k_4 and k_{-4} already described above.

X. CONCLUDING REMARKS

Over the past year, our group (the Model G Vortical Motion Group) has been attempting to progress subquantum kinetics by including vortical motion/rotation into the reaction-diffusion equations in the hope of modeling quantum particle spin. SQK theorizes that an ether vortex would develop in the particle's core and that this produces what physicists refer to as particle spin magnetic moment. Achieving this would make Model G (i.e. SQK) more physically realistic, thus upgrading it and allowing it to describe science and technologies at quantum level. At present, physics has no official conceptual model of what spin is, it just assumes it as a property of subatomic particles. SQK goes further to explain the details of how spin forms. Currently we are also working to simulate Model G in two and three dimensions. We hope this will eventually allow us to simulate solitons that demonstrate the ability to elastically scatter from other solitons in a way similar to what takes place in the physical world on the subatomic level.

Utilizing the open system paradigm Subquantum Kinetics (SQK) (or Model G) allows us to analyze many propulsion and over-unity energy technologies that cannot be explained by conventional physics. The electro-gravitic technologies which thus far have been explained using the SQK paradigm include: Townsend Brown's electro-gravitic thruster; the Podkletnov gravity impulse beam, and the Searl disc [27]. It also provides a useful paradigm for understanding how unbalanced electrostatic or magnetic field forces can induce a net propulsive thrust, as in the case of T. T. Brown's asymmetrical capacitor and the Nassikas superconducting thruster. [27]–[29] SQK conceives the electric field potential (ether concentration gradient) and magnetic field (ether vortex currents) as being seated in the ether as opposed to being attached to the field sources that generate them. SQK provides a framework for understanding the functioning of technologies that can tap into the ether and create energy that is clean and very cheap! It therefore provides a new paradigm for physics, one where over-unity energy generation becomes possible.

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