



# Developments of Mathematical-Physical Biology, Matrix Mechanics in Pharmacology, and Medicine with Time Sequences

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## Article History

Received: August 19, 2021

Revised: October 9, 2021

Accepted: October 12, 2021

Published: October 15, 2021

## Abstract

First, some mathematical and physical developments of biology and medicine are discussed, including biofield and biological electromagnetics. Second, we research nonlinear biology and biotopology, in which some knots may describe the protein folding. Third, symbolic dynamics of biology and the extensive quantum biology are researched. Fourth, we study the biothermodynamics and entropy. In thermodynamics of pharmacology, the main effects of various drugs are to promote internal interactions in body, and entropy decrease. Further, we introduce the diagnostic space, treatment space and some medicinal vectors, and propose the matrix mechanics of pharmacology. Finally, we research biology, medicine and pharmacology with time sequences. If we master the medication time, this will be able to get the minimum amount of medication, and the drugs can play the maximum treatment effect. If period is accurate, it can determine the time of play, negotiations, attack, etc. But, period of each individual should be change follow age, etc. This is a very valuable research.

**Keywords:** Biology; Medicine; Physics; Nonlinearity; Thermodynamics; Biotopology; Matrix mechanics time sequence.

## 1. Introduction

So far a sudden COVID-19 swept the world crazily, which casts a huge indelible shadow on the whole society and everyone's life. Face unexpected disasters medicine and pharmacology emerge the importance in world.

Based on the inseparability and correlativity of the biological systems and human body, we proposed the nonlinear whole biology [1, 2] and the nonlinear whole medicine [3], and their basic hypotheses [1-3]. The propagation of COVID-19 is a typical nonlinear process with fractals and chaos. A key of controlling COVID-19 prevents propagation from reaching an irreversible chaos point. From corresponding nonlinear equations and their solutions, we may obtain three basic origins of disease, and corresponding therapeutic methods may be applied to COVID-19 [3]. This testifies that research on infectious diseases must apply the nonlinear whole medicine.

The nonlinear whole biology may unify reductionism and holism, structuralism and functionalism on biology [1, 2], and is consistent with systems biology [4-6], which integrates multiple different levels in biological systems, from multiple molecules, cells, individuals, to populations, communities, ecosystems [7]. Furthermore, it may quantitatively simulate the biological structure and physiological function from gene, cell to whole organ and system [8]. The hypercycle proposed by Eigen [9] is a typical and perfect theory of the nonlinear whole biology. In this paper, we discuss some mathematical and physical developments of biology and medicine, which include biofield, biotopology and biothermodynamics, and propose the matrix mechanics of pharmacology, and research biology and medicine with time sequences and their applications.

## 2. Some Mathematical and Physical Developments of Biology and Medicine

The three hotspots of modern biology are molecule, cell and neural biology. They are quantum, molecule, cell and complex biology. These are all mathematical-physical biology. Its features are: from morphology to structure, from macroscopic to micro level, from qualitative to quantitative, and from description to analytics.

We believe that there are some corresponding relations between biology and physics, and the human physiological systems have corresponding mechanics. The movement (skeletal) system corresponds to structural mechanics. The cycle (blood) system corresponds to fluid dynamics; the respiratory system corresponds to aerodynamics; the two are related to limit ring, period, quasi-period. By mechanism of bifurcation-chaos, chaos may extend to complex numbers, and obtain Julia sets. The digestive system corresponds to the thermodynamics. The reproductive system corresponds to electrodynamics; the egg corresponds to the nucleus, the sperm to electrons, all moving; the Pauli principle corresponds to love, selfish and monogamous. The neural systems may correspond to quantum mechanics, and fractal, solitons; brain synthesizes feedback results from various systems. These are all nonlinear interaction, and chaos leads to information. There are other endocrine and urinary systems. Vision

corresponds to the optics, but does not form a system. Of course, biology and medicine apply physics, which may have some particularities because of biology with some special constituents, structures, and special complexity, etc.

The nine systems of the body perform their own duties, and are interrelated, but there are masters or minor, and correspond to the serving principle of synergetics. Thus there are nine related equations, which can also be manifested as the influence of the initial conditions. A system adds the nonlinear interaction terms, and may describe the effects of each other.

Human physiological systems are based on the simpler physics, and produce the structural complexity or the compositional complexity, and forms finally the functional complexity [10]. But, these complex systems as a set of the same single individuals should all conform to the statistical law. In the late 20th century the main theme of science is a natural tendency of self-organization, a natural dynamics of more advanced complex systems from disorder to order, from opportunity to law, from chaos to the emergence of structure [10].

Different sensation systems are usually independent each other. Our collective open out the potential of blind children, and found through a period training of time, some children by touch or nose or ear can distinguish different colors, even simple figure and numbers. From this and other research, we proposed a hypothesis: The neural excitable cell is continuously induced and excited, then grow out new synapse and dendrite, and the feeling system, hearing system, smell system, etc., may joint to visual system, and form a new neural network, and achieve finally a transformation among vision and other sensations. Further, we proposed some possible tests, for example, for trained mammal, etc. This is also a testable application of the nonlinear whole neurobiology. It may build a bridge between modern science and traditional culture, religion [11].

There are already various groups in geometry, physics and chemistry. We should develop biological groups, ecological groups, and physiological system groups. These are applications of group, symmetry and their breaking in biology.

In 1978 Rich discussed the biofield [12]. Rubik investigated the biophysical basis on the biofield hypothesis and its role in medicine. It is complex and very weak biological electromagnetic fields, and is consistent with non-equilibrium life systems of bioelectromagnetism and nonlinear dynamics [13]. Rein discussed the bioinformation within the biofield on beyond bioelectromagnetics [14]. Further, we can introduce basic description methods of various mathematical-physical fields in biological fields, and search commonalities and possible differences in various biological fields. For special fields, they are similar physical fields. Generalized fields may be information, medical biological fields, air diagnostic techniques, and even stomach field, etc.

Coffey used nonlinear dynamics and chaos as the new biology for medicine, and explained complex biological systems and self-organization on the events leading to disorders as varied as epilepsy, heart disease and cancer [15].

The human body has heart electricity, brain electricity, nerve electricity, skin electricity, muscle electricity, etc., and all organs and tissue activities to produce biological electricity. These also produce biological magnetism. They form bioelectromagnetic fields. Govern biological processes are mainly electromagnetic interactions, especially the electrostatic Coulomb forces. Ultra-weak luminescence is only a few to tens of photons per second, and corresponds to life phenomena, which is coherent emission. Cells emit different photons during each division process. This can be used for medicine, etc. All the exciting processes of animals, including humans, are accompanied by current generation in the muscles and nerves. Even the leaves of insectivorous plants pass also through bioelectricity.

“The holistic health care” is performed internationally. This is completely consistent with the traditional Chinese medicine. So the world is an interconnected whole, and corresponds to the nonlinear whole biology Chang [2] and medicine Chang [3].

### 3. Nonlinear Biology and Topological Biology

Van der Pol equation is:

$$x'' + \alpha(x^2 - 1)x' + \omega^2 x = b \lambda \cos(\lambda t + \varphi) \quad (1)$$

It describes approximately the pulsation of heart. The non-harmonic oscillator with force is:

$$x'' + kx' - \beta x + \alpha x^3 = b \cos(\omega t) \quad (2)$$

The nonlinear oscillation equation may derive soliton.

In the long-term evolution life forms a nonlinear, multi-level, complex and complete system. A well-known FitzHugh-Nagumo kinetic equation of a single neuron under the noise action is:

$$c \frac{dV(t)}{dt} = V(t) - V^3(t) - y(t) \quad (3)$$

$$\frac{dy(t)}{dt} = \gamma V(t) - y(t) + b + \sqrt{2D} \xi(t) \quad (4)$$

Here  $\xi(t)$  represents Gauss white noise.

Ditto discussed applications of chaos in biology and medicine [16]. The nonlinear Hodgkin-Huxley equations are the best model of neurons and neural network. A basic method for these equations is the qualitative analysis theory [17], whose results are mainly topological structures.

Topology as the mathematical study of shapes and topological spaces is applied to biology from DNA, heart stimulation, to population modeling, etc [18, 19]. Differential manifold as topological space with differential structures are applied to various regions. Kelly searched bitopological spaces [20]. In dynamical systems a closed

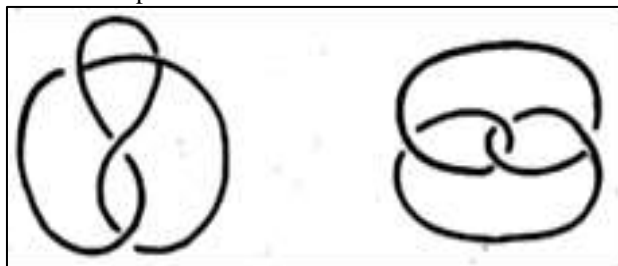
invariant set may be topologically transitive [21]. In topology different knots correspond to different polynomials and catastrophe theory. In communication networks, topology is usually a schematic description of the arrangement of a network, including its nodes and connecting lines. There are two ways of defining network geometry: the physical topology and the logical topology. In topological space homeomorphism is continuous, and there have homotopy of paths and homology of surfaces, etc Munkres [22]. In topology there have some topological invariants, for example, Euler’s numbers, topological charge, topological soliton, etc.

Based on topological biology and structural biology, and combined the extensive quantum biology and general biological string, we proposed that Calabi-Yau manifolds can provide a mathematical method to be applied to biology. Some Calabi-Yau spaces may possibly describe the biological spatial structures, in particular, in NeuroQuantology. In biology usual Calabi-Yau manifolds are also smaller and cannot be observed except microscope. It is used to superstring and brane, so may also describe some biological strings, and biological branes, etc. Further, this may combine the extensive graph theory, which includes five types of the basic elements: various solid lines, dotted lines, wavy lines, and vertices, fields. Variegated Calabi-Yau manifolds and superstring-branes correspond to multiformity of biological structures [23]. Based on a discussion of the topological physics, we introduced the general topological sciences, and researched string and its developments. Some new questions on superstring, and the emergence string and its mass formulas of particles are searched [24].

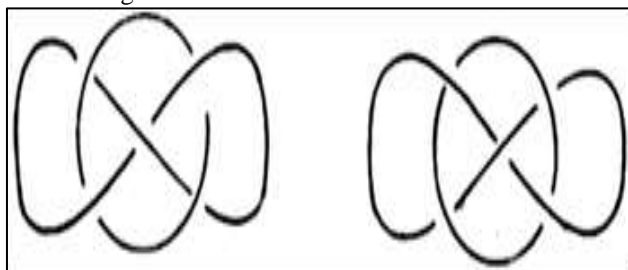
In 1966 Marvin and Schaller discussed the topology of DNA from the small filamentous bacteriophage fd [25]. In 1986 Kamp and Roelofsen summarized a biotopology in past, present and future [26]. Baumgartner, et al., proposed that the biological way may find an optimum structure topology [27].

In molecular biology there is DNA topology. Paci, et al., searched structures of proteins described by topology [28]. Anfinsen principle forms self-assembly theory of protein folding, for example, Anfinsen cage model, macromolecular crowding [29]. Akey, et al., studied nucleoplasm and molecular chaperones, which is similar with enzyme [30]. Hartl et al., seared molecular chaperones in the cytosol [31]. Alam, et al., discussed the importance of knotted [32].

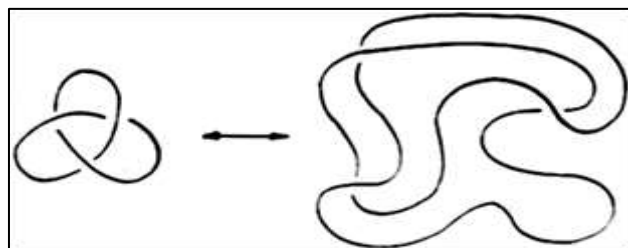
Moreover, in topology there have 8-shaped knots:



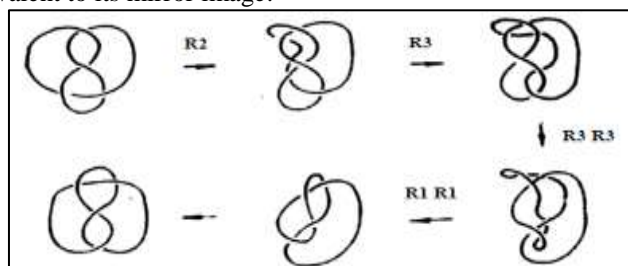
Anti-Wighthead link and Positive-Wighthead link:



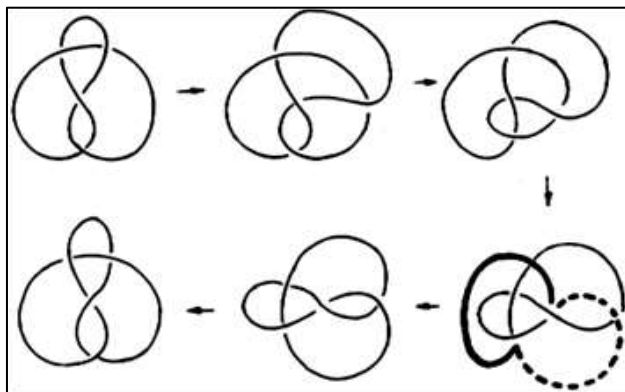
“Plane deformations” are:



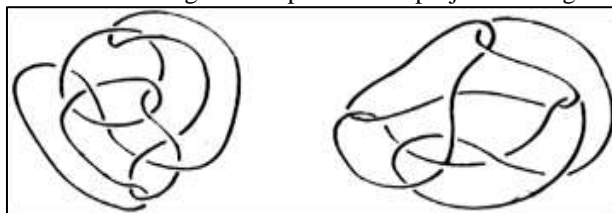
The 8-shaped knot is equivalent to its mirror image:



General deformation may be:



In 1985, it has been proved that the following two 13-point nodal projection diagrams are equivalent.



These may describe the protein folding.

#### 4. Symbolic Dynamics in Biology and Extensive Quantum Biology

Further, topology in the metric space may be described by symbolic dynamics. Pigolotti, et al., discussed symbolic dynamics of biological feedback networks with monotonic interactions, such as most biological modules [33]. Networks which are more complex than simple cyclic structures can exhibit multiple different symbolic dynamics. Arroyo, et al., analyzed a simple neural network, a Central Pattern Generator [34]. Symbolic dynamics can be used to characterize coordinated activity in the context of biological neural networks, and to compute entropy and distinguish between networks with the same topology, and the methodology can be applied to the generalization of closed-loop observation and control of complex biological systems.

At present the nonlinear whole biology [2] is the holistic cellular biology. Wuthrich, et al. discussed pseudo-structures for the 20 common amino acids in protein conformations by measurements of intramolecular proton-proton distance constraints with nuclear magnetic resonance [35].

We proposed the extensive quantum biology, in which the formulations are the same with the quantum mechanics and only quantum constant  $h$  is different [36]. DNA is an important basis of molecular biology [37]. It is well-known that the model of DNA is a double helical structure. Its basic elements are A-T and G-C. There is structural genomics, which has four elements (A, G, T and C). Assume that quantum elements of double helical structure DNA are A-T and G-C. We proposed the extensive quantum theory of DNA, and its many mathematical methods may be applied to DNA and molecular biology [38]. Further, we derived that the Schrödinger equation with the linear potential may become the Bessel equation. Its solutions are Bessel functions, and form the double helical structure of DNA in three dimensional spaces [39]. From this model we may predict the discrete bound energy spectrum of DNA. Moreover, we discussed some solutions of quantum mechanics and their meaning, and researched the entangled state of neurobiology by the extensive quantum method and the nonlinear theory. New experiments shown that the quantum entangled state should be a new fifth interaction, for its verification neuroscience will possibly take a very important role.

Pulses, solitons, and synapses are all quantized, and are probably related to nonlinear mechanism of memory [36]. They can correspond to the extensive quantum biology [36].

#### 5. Biothermodynamics and Entropy

First, in 1944 Erwin Schrödinger published a farsighted book about the concept of life [40]. He discussed three problems of fundamental importance for biophysics: The thermodynamic bases of life and the molecular basis of life, while the normal biological processes are consistent with the laws of physics. He pointed out that “an organism feeds with negative entropy (neguentropy)”.

General biophysical thermodynamics corresponds to the metabolism of living matter [41], and for a spontaneous process the second law of thermodynamics usually [42] is:

$$(\Delta S_{system} + \Delta S_{surroundings}) > 0 \quad (5)$$

Jean introduced a concept of entropy in the domain of growth as an application of the Principle of Optimal Design, and presented this development using the four kinds of axioms found in axiomatic mathematical physics. But, it is different from 'entropy' in the physico-chemical sense [43]. Matthews, et al., proposed that the stability of a

protein can be increased by selected amino acid substitutions that decrease the configurational entropy of unfolding [44].

Edsall, et al., discussed generally biothermodynamics [45]. Wiesinger, et al., investigated the thermodynamic data for biochemistry and biothermodynamics [46]. Kennedy researched biothermodynamics for sustainability of action in ecosystems [47]. Further, biology requires the nonlinear thermodynamics. Ilya Prigogine, et al., developed nonlinear thermodynamics and a dissipative structure theory [48]. Volkenstein study general physics and biology [49].

Page, et al., discussed entropy of activation, in which smaller entropy changes from the restriction of internal degrees of freedom occur in cyclization reactions [50]. Hydroxide ion attack on esters is associated with a large decrease in entropy. Keller gives an outline of basic aspects, changes and actual examples in this field, the basic concepts and laws of thermodynamics extended to systems with internal variables, which serve as models for biofluids and other biosystems [51]. Stockar reviewed biothermodynamics of live cells as a tool for biotechnology and biochemical engineering [52].

Based on the biothermodynamics and bio-entropy, we proposed possible entropy decrease due to internal interactions in some isolated systems in biology, in which the neuroscience, the permeable membrane, the molecular motor, etc., are all some internal interactions [11]. We proposed entropy decrease as an index of therapeutics in biophysics, and life lies in a combination between motion and rest, etc. Further, some new research in biothermodynamics are discussed [11, 53]. Biological system of entropy decrease can have different levels: membrane, enzyme, molecular motor, and adenosine triphosphats (ATP). We should study the biological entropy, and the general relation of entropy and metabolism. Biology survives by negative entropy which corresponds to temperature. Each organism has a particularly adapted temperature, such as 37C for human. Hibernate is an ordered state where the entropy decreases for animals as an isolated system. The production and self-organization of biology and humans all rely on self-interaction. Because life in the Earth cannot be produced spontaneously only be due to the Sun, at least can not evolve.

The life developed process is from disorder to order, and information increases; the life decay process is from order to disorder, and entropy increases; in the middle phase is the dissipative structure, the entropy remains unchanged, and equilibrium. The origin of life from disorder to order must be entropy decrease with interactions [11, 53-61]. This is the general principle. It is the entropy decrease in the life sciences. Posttranslational quality control [62] is namely an auto-control as Maxwell molecular demon. We must research energy absorption or energy release conditions in organisms, their entropy increase or entropy decrease [11, 53-61], and discuss the huge functions of mitochondria, chlorophyll, and enzymes in living organisms. Self-catalytic reactions in organisms, etc., and their thermodynamics, especially the interactions and entropy of isolated systems should be discussed. Biothermodynamics must combines the dissipative structure, and introduce force, flow, entropy, etc.

Entropy decrease is a change of entropy  $dS$  extended from the positive number to the entire real axis included negative number,  $dS(+R,0) \rightarrow (+R,-R)$ . Further, we suppose that entropy can extend to the plane of complex number.

It corresponds to  $dS$  is a complex number, whose pure form may be  $dS + id\tilde{S}$ , whose meaning is possibly that  $dS$  represents quantity of change, and  $d\tilde{S}$  represents undulate of change. They can correspond to vectors and the life index on heartbeat, breath, blood pressure and so on. Moreover, these formulas may combine theories of Schrödinger [40] and Prigogine [48].

We derived a total formula of entropy change for any natural and social systems [36, 59, 63]:

$$dS = dS^a + dS_+^i - dS_-^i + dS_i + dS_e^+ - dS_e^- \quad (6)$$

Further, we proposed an entropy index of health and therapeutics in biophysics on human body:  $dS/dt$  should be least, even at period of time, man (woman) can regulate breath, body and ideology, and reach to  $dS/dt < 0$ . This is namely:

$$dS_2 / dt > dS_1 / dt > 0 > dS_1^- / dt > dS_2^- / dt \quad (7)$$

$$\text{i.e., } dS_2 > dS_1 > 0 > dS_1^- > dS_2^- \quad (8)$$

This may be applied to investigate cure of disease. J.West and S.Severini, et al., discussed entropy in the cancer cell, and dynamical network entropy in cancer. It is often propitious to prolong of life for many animals and human practices. This is an order out of chaos [63], and corresponds also to the balance between Yin and Yang in the traditional Chinese medicine. We have studied a system of nonlinear whole medicine [2, 3].

It is known that bacteria have language to communicate, change behavior, coordinate and evolve. This is the information (an interaction) can derive entropy decrease. It corresponds to the Buddha field and special functions. Other animals and plants are more language.

Quantum biology should combine and apply thermodynamics and entropy, which will correspond to quantum statistics.

Modern medicine confirms that various diseases originate mainly from three main causes: genetics, the environment, and infection. The basic way to treat cancer should be to promote the death gene of cancer. The most essential way for cancerous cure should be an enzyme or molecular chaperones, which may disassemble cancer cell with the excluded volume effect.

Modern medical experiments have shown that limiting caloric intake may reduce the prevalence of cancer. Food restriction can strengthen the cell repair ability of DNA, and reduce the generation of free radicals, and increase the activity of antioxidant enzymes, peroxidases, and superoxide formatases. In a word, food restriction puts the cells in

a restored state, and relieves the oxidative stress.  $dS=dU/T$ ,  $T=37C$  is basically unchanged. So smaller  $dU$  corresponds to smaller  $dS$ , and  $dU<0$  and  $dS<0$ .

Nobel laureate and founder of quantum chemistry, Pauling said that people are ill because of the dyscomposition of chemical molecules in the body in the orthomolecular medicine. This is consistent with traditional Chinese medicine in which the imbalance between Yin and Yang leads to illness.

## 6. Matrix Mechanics of Pharmacology

Pharmacology studies interaction principles and mechanism between drugs and organism, which includes pharmacodynamics and pharmacokinetics. Drugs include chemical drugs and biological drugs in modern medicine, and natural drugs in traditional medicine.

In modern medicine selectivity and specificity of drugs are all the directional internal interactions. For the human body they must derive entropy decrease, whether for the etiological treatment or the symptomatic treatment. This cannot consider that phenotype of drug effect, excitation and inhibition, central stimulants and sedative drugs, immunosuppressive agents and immunostimulants all are entropy increase. Only various adverse reactions are entropy increase. Therefore, except trauma and surgery, in the final analysis, almost all treatments are mainly based on the internal interaction in body as isolated system. Disease and death are entropy increase. Conversely, disease recovery and growth are entropy decrease, and are mainly internal interactions. Treatments are mainly internal conditioning.

The mechanism of drug actions, whether acting on the enzyme or receptor or carrier or gene, especially as the relations between the receptor and the ligand, the dynamics of drug and receptor reactions must be internal interactions.

In pharmacokinetics the processes of drug in the body, including absorption, distribution, biotransformation and transport, etc., are all internal interactions. In particular, in compartment model of pharmacokinetics the body acts as a system of multiple rooms must be an isolated system, in which the concentration change rate is described by the nonlinear Michaelis-Menten equation.

Cell dynamics studies the changing rules of cell growth, reproduction, differentiation and death. The basic pharmacological action of antineoplastic agents affects mainly the biochemical process of biomacromolecules, and derives important genetic substances and protein metabolism disorders in cells, and prevents the division and reproduction of cell disorder. Gene therapy is a medical intervention based on modification of genetic material of living cells. It includes gene correction and gene replacement. Antisense drugs are a class of synthetic drugs carrying biological information, and are called as information drugs.

The same drugs, i.e., input the same energy and entropy, will produce different effects for various factors, which include age, sex, genetic factors, etc. Here emotional factors, pathological states, etc., all are some internal factors.

Basic method of traditional Chinese medicine is treatment based on an overall analysis of the illness and the patient's condition. It is applied by the wholeness of the human body and the relevance of its parts.

In 1989 we proposed that the theory of traditional Chinese medicine is based on strict mathematical symmetry group, in which the Yin-Yang theory is the simplest binary symmetry group, and the Five-Elements theory is the five element rotation group [64]. Further, the extensive quantum medicine is related to the space of Five Elements and Eight Diagrams [65]. Yin-Yang, Five Elements and Eight Diagrams as the corresponding basic vectors in n-dimensional space form a diagnostic space. A person's state of illness as a vector is projected in this space. At the same time, i type of the drugs used constitute a set of agents, and the characteristics of each drug are also quantitatively projected in the diagnostic and treatment space. From this we obtain the equilibrium relations and a set of equations, and corresponding matrices. Such it can solve the amount of the drug used according to the vector value of this human.

More specifically, we list several equations corresponding to n dimensional diagnostic space, let  $(b_1, b_2, b_3, \dots, b_n)$  is the projection of a person's state of illness in n dimensional space, which forms a vector B with n row and 1 column on state of illness. Let  $(a_{1i}, a_{2i}, a_{3i}, \dots, a_{ni})$  is the projection of i type of drug in n dimensional space, so that the set of agents used forms a matrix A with n rows and i columns. So the equations can be simplified as matrix equations:

$$BX = \begin{pmatrix} b_1 \\ b_2 \\ \dots \\ b_n \end{pmatrix} X = \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1i} \\ a_{21} & a_{22} & \dots & a_{2i} \\ \dots & \dots & \dots & \dots \\ a_{n1} & a_{n2} & \dots & a_{ni} \end{pmatrix} = A \quad (9)$$

Its solution is:

$$X = B^{-1}A = (x_1, x_2, x_3, \dots, x_i) \quad (10)$$

It is a row vector with 1 row and i column, and its value is namely the amount of each i type drug used to treat this person.

The dimension of diagnosis and treatment space is different, the number and elements of agents collection are also different, the corresponding equation can have multiple solutions, which corresponds to a variety of treatment

can be used prescriptions. Further, this set of linear equations may have multiple solutions, unique solutions, or even no solutions. The latter is namely that for this illness there was no cure in the circumstances.

In fact, this approach is universal method in any pharmacology, and can be extended to general medicine. The specific law is: first find out a number of indicators of the treatment of some diseases, such as the circulatory diseases are heart rhythm, blood pressure, blood lipid, heart tone and so on. They as a group of linear independent base vector constitute a space for diagnosis and treatment. Other diagnostics can be used as boundary and initial conditions for the equation. Secondly, the patient's conditions and the performances of each drug are quantitatively projected in this space. Third, list the equations and their solutions. If a drug  $k$  is not effective to treat the disease, it will be a zero vector in the diagnosis space, and its dose must be  $x_k = 0$ . This is the most basic approach of drug matrix mechanics. Various formulas and methods of linear algebra can be applied in medicine and pharmacology. Since the quantification of the diagnosis of modern medicine, this method is probably more suitable.

## 7. Biology, Medicine and Pharmacology with Time Sequences, and Their Applications

Biology, medicine, pharmacology with time sequences are related to the human drug synergetics. It is known that human physical strength, emotion, and intelligence have 23,28,33 days periods  $T$ . If time is started from the birth date, and listed as a sine function wave. Such  $365.2422 \times \text{age}$  add this year excess days, and is divided by  $T$ , then equal integer quotient and remainder. Remainder as started, time  $T = (5.75, 7.7, 8.25)$  is peak,  $T' = (11.5, 14, 16.5)$  is critical point and  $T'' = (17.25, 21, 24.75)$  is valley. This is an internal condition. For 23 days period, three points are  $t = (5.75, 11.5, 17.25)$ . For 28 days period, three points are  $t = (7, 14, 21)$ . For 33 days period, three points are  $t = (8.25, 16.5, 24.75)$ . Consider the rhythm of the body and its various waves, and combine with meridian notes (子午流注). Thus, the drugs can play the most effect when treating the disease. Further, if it is accurate, this can determine the time of play, negotiations, attack, etc. This is similar to the ancient spell of witchcraft, and according to periodic fortune-telling, etc.

The period of each individual should be not exactly the same, and his (or her) best period and starting point can be determined by the experimental results. And at different stages, such as babies, teenagers, youth and old age, periods are change. It should be adjusted appropriately.

The corresponding drug matrix mechanics can be developed into open models, dynamic models, and can combine biological rhythms, meridian injection, time medicine, etc. For example, if a value  $b_j$  varies with the day and night cycle in the human condition vector:

$$b_j = b_0 \cos \omega t \quad (11)$$

Such each value in the dose vector is associated with  $\cos \omega t$ . If we master the medication time, this will be able to get the minimum amount of medication and the maximum treatment effect.

The periodic basis of traditional Chinese medicine is Yin and Yang, Five Elements and five-dimensional rotation groups [64]. Rao, et al., researched relation between quantum medicine and modernization of traditional Chinese medicine [66]. In short, the biology and medicine with time sequences are very valuable research.

In 1985 Goldberger et al., proposed the fractal hypothesis on a mechanism of cardiac electrical stability, and some observations on the question as ventricular fibrillation 'chaos' [67, 68].

For fractal medicine and physiology, some fractals are independent on human, which corresponds to the scaling invariance and universality. Healthy people and adult  $D$  are basically unchanged, but the adult  $D$  is greater than the fetal  $D$ . We extended the fractal dimension  $D$  into the complex dimension, in aspects of both mathematics and physics [69, 70]. The representation of complex dimension is:

$$D_z = D + iT \quad (12)$$

When the complex dimension is combined with relativity, whose dimensions are three real spaces and one imaginary time which expresses a change of the fractal dimension with time or energy, etc., and exists in the fractal description of meteorology, seismology, medicine and the structure of particle, etc [69, 70].

In 1960s Cleve Backster discovered some plants have consciousness. In 2012 Ben Bending confirmed plants have some kinds of perception, and may feel human emotions. Parapsychology researches psi field. Hans Frohlich assumed that all parts of the life system can create fields of various frequencies. This is an extensive thought field [69, 71, 72].

Japanese scholars researched pronunciation of plants, and plants can make a variety of sounds. These are various languages of plants, or are only the vibratory pronunciations. Further, we should study their similarities and differences with animal sounds, music. Whether different and similar plants can communicate each other? DNA continuous time walking method has different embedded and uncontained curves, which may apply the Fourier method, and can be related to music. Moreover, we may research sound medicine and more general resonance medicine. It can contact the existing traditional Chinese and western medicine, Qigong, special functions and mantra, etc.

In 2019 Haken and Tschacher published a new book *The Process of Psychotherapy*, which specifically explored psychotherapy and its various applications [73]. Modern medicine tends to 4P medicine with predictive, preventive, personalized, and participatory. This is completely consistent with traditional Chinese medicine and health preservation.

Further, we proposed three dimensional body-mind-spirit worlds on human society. Some observed results imply "ghosts" are probably the existences of some biological or non-biological objects. Any observations and detections on mind and spirit worlds and on relations between both and matter are all valuable. Moreover, we proposed the Chinese cultural-social ecology, whose aim is human and nature are completely harmonious, and reach the highest state of the unity of nature and human, from this explore the way to resolve the human crises. Human decision-making will shape the future of our world [74].

In a word, we believe that the treatment is mainly based on internal interactions, including gene interactions, self-healing. Drugs enter the body, which form also an isolated system. Drug effect mainly depends on the reaction process between drug and the target site of organism. Various mathematical and physical methods apply continuously different aspects in biology and medicine, and these will accelerate deep development of modern biology and medicine.

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