

# DISSIPATIVE STRUCTURE OF ELECTROMAGNETIC FIELD IN LIVING SYSTEMS

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## Summary

Introduced in this paper is a dissipative structure of electromagnetic field, which is composed of interference patterns of chaotic standing waves within the boundaries of the resonance cavity of the living organism with permanent support of energy of the open thermodynamic system. The invisible structure is closely related to the mysterious acupuncture system and many “energetic medicines” whose working mechanism could not be completely comprehended within the present knowledge of anatomy, physiology and molecule biology that presently represent the basis of conventional Western medicine.

Key words: acupuncture, energetic medicine, electromagnetic field, chaotic standing wave, holography, coherence.

## Introduction

Nowadays, there is a “fever” of Oriental medicines in Western countries. The natural consequence of this is the effort of the scientific community to study exotic ancient medicines such as acupuncture and some others by means of modern science.

At first glance, the topic of the “modern scientific basic research of acupuncture” is to look for the explanation of the mechanism of old medicine in terms of modern science. However, the real meaning of this is a kind of exchange and merger between the Eastern and Western cultures. In other words, the task of the modern scientific basic research of acupuncture is to try to understand the exotic Oriental medicine in the viewpoint of Western people and culture, since modern science and the conventional Western school of medicine were developed in and based upon the Western culture.

But what on earth is the difference between the Eastern culture and the Western culture? In the area of medicine one of the big differences is that Eastern medicines, in particular acupuncture practice and theory, pays much more attention to the “function” than to the “structure.” It is based on a belief that as long as a remedy works it is a good enough. On the contrary, Western medicine pays much more attention to “structure” than to “function” based on the belief that “man is a machine” as proposed by René Descartes, that is, human body is merely a complicated machine and a medical doctor is an engineer. The more the engineer knows the machine the better he is able to repair it when it is out of order. The strong belief in “man is a machine” provides a powerful motivation to dissect human body, to develop anatomy, cell biology and molecule biology, which constitute the solid and very reliable base for modern Western medicine.

Therefore, if we are able to find the “structure” corresponding to the “function” of Eastern medicine, in particular the mysterious acupuncture system, both Eastern medicine and Western medicine would make a great progress and merge into one, new, united and much better medicine. With such a simple motivation, the “modern scientific basic research of acupuncture” was initiated in 1950’s.

## “Function” vs. “Structure” of Acupuncture System

The path of searching for the special structure corresponding to the mysterious function of acupuncture could be divided into four stages as follows:

### Looking for Anatomic Structure - The First Stage.

At first, researchers expected to find some pipelines which would be completely corresponding to the acupuncture meridians, could be observed with a naked eye or under a microscope, and could be preserved in specimen bottle like many other organs and vessels in the classroom of anatomy, since anatomy is the most fundamental base of Western medicine. There are many scientists<sup>1,2,4,9</sup> who explored the structure but no one was so provocative as the North Korean scientist B. H. Kim<sup>1</sup>, who in 1963 announced that he had found a new system composed of “Bonghan corpuscles” which are corresponding to acu-points and “Bonghan ducts” corresponding to acupuncture meridians. For some special reason, his work was over propagated by newspapers and magazines in North Korea and in many Eastern countries so that he was regarded as a national hero of Korea.

Of course, it was also striking news in scientific community all over the world. Many scientists in China, Germany, France, Austria, United States etc.<sup>2,4,9</sup> have repeated his work, but no one could confirm his discovery. The noted Austrian histologist G. Kellner<sup>2</sup> wrote a long paper titled “Structure and Function of Skin” after carefully repeating Kim's experiment. In his opinion, the so-called “Bonghan corpuscle” is actually the “end body” which is a residual stump of capillary remained after embryonic development; and the “Bonghan duct” is actually the corresponding residual capillary. The early stage of development of circulation system in an embryo is not a closed system, but in some way like a tree. Then many ends of capillaries meet one another to form a closed circulation network. However, there are still ends of capillaries remaining open in the form of residual bodies. They do exist in the skin and other places of a body as real structures and react to the stimulation of acupuncture operation, but they do not carry the function of the acupuncture system. Therefore, the big and exciting news turned out to be a big scandal in science. It was rumoured that Kim committed suicide after revelation of the scandal.

### Placebo Effect or Real Thing - The Second Stage.

The scandal or the tragedy of Bonghan Kim was, of course, a big blow. Because of the failure, the scientific basic research of acupuncture went into the darkest period of its history. The question about the mechanism of acupuncture became “Does acupuncture system exist objectively?”. The common opinion in the scientific community at that time was that the acupuncture is “unscientific”, “ridiculous”, “mysterious”, “incredible”, “impossible”, “pure imagination” etc.<sup>3</sup>

One example in China could show how terrible the attitude of some scientists was at that time. At the First National Conference on Acupuncture in China [19??], those patients who had a “sensation propagated along meridians” when stimulated by doctors were required to undergo some psychological tests in order to check whether they had mental disorders.<sup>3</sup>

Naturally, such a suspicious attitude badly hurt feelings of the acupuncturists and other traditional Chinese medical doctors, for it meant that all their needling operations were based on some mirage and were, of course, pure placebo, if sometimes acupuncture worked in a clinic. For this reason, a nation-wide investigation was organized in the 1970's in China to verify the existence of the “propagation of subjective feeling along a meridian” during acupuncture operations. 18430 persons of various ages and races were investigated. 24% of them had the feeling of “Qi” travelling along the meridian during acupuncture operation, which made a 24% probability of occurrence. Although it was only an investigation of

subjective feelings, not an objective one, it would be impossible to suggest that so many people in different places had told the same lie. Besides, it was found that the speed of “Qi” propagation through meridians is extremely low, only between 10 and 22 cm/sec, much slower than the pulse travelling in nerve fibres at the speed of about 20 m/sec. 4

Meanwhile, many methods of objective detection on acu-points and meridians have been developed, in particular based on the unique electrical characteristics that distinguish them from surrounding skin. The electrical characteristics were at first found by German doctor R. Croon 5 in 1947, then independently found by Japanese doctor Y. Nakatani 6 in 1950 and developed into a diagnostic system by other German doctor E. Voll 7,8 starting in 1953. What is more, E. Voll found a close relationship between acupuncture and homeopathy, which shows that there is some common base in these two old medicines.

The diagnostic system based on electrical characteristics of acu-points and meridians spread into Russia in 1970s and then into America as complementary or alternative medicine. 9,11,12 Today, the electro-acupuncture is being widely used all over the world. Besides the practical use of electro-acupuncture, its popularity serves as a strong evidence of the objective existence of acupuncture system, though we are still unable to see it by a naked eye or through a microscope.

### **Physiological Research - The Third Stage.**

The aim of the third stage of the modern basic scientific research of acupuncture came from the contradiction between the failure of looking for anatomic structure in the first stage and the confirmation of the real existence of acupuncture system in the second stage. The idea was that the “function” of acupuncture is only some yet-unknown phenomenon of the well-known “structure” of anatomy and physiology. 4,9,10,12

Typical works at this stage are, for instance, the research in the current which is induced by injury since some researchers considered that the effect of needling operation comes from the electric current which is induced by needling, the research on release of endorphin by Bruce Pomeranze<sup>12</sup> in Canada in 1970s; the research of radioactive tracers by Bong Han Kim 1 in Korea and by Xiao-Bo Qiao 4 in China in 1960s, by Claude Darras and Pierre De Vernejoul 12 in France and by Jing-Bi Meng 4 et al. and many others in China in 1980s; the research of brain image by Zang-Hee Cho<sup>12</sup> in the United States and so on. To their amazement, for instance, needling of the acu-points on the foot that were said to stimulate the eyes caused the visual cortex, the brain region associated with vision, to light up in all the volunteers tested. Sticking an acupuncture needle in the acu-point on the foot had the same effect on the brain as shining a light into a person’s eyes.

In the viewpoint of the modern science classification, the basic research of acupuncture is an interdisciplinary work. In such case, many scientists from different disciplines are involved into the research. Dozens of various hypotheses about the mechanism of acupuncture were put forward 4,21 and the situation reminds the old story of “blind men studying an elephant”. Of course, many of them sound mutually contradictory which is terribly confusing, even frightening to practitioners and researchers as well.

### **Invisible New Structure - The fourth Stage.**

As a matter of fact, it was really impossible until recent years to find the new structure corresponding to the function of the mysterious acupuncture system without the revolutionary discovery of “dissipative structure” in 1970-80’s, and further development in physics in 1990’s, instead of anatomy and physiology.

The concept of “dissipative structure” was put forward by Belgian scientist Ilya Prigogine 21, who made several revolutionary contributions to modern science. He changed the framework of research from “isolated systems” to “open systems”, from equilibrium state

to non-equilibrium state, and finally from static structure to dissipative structure which is a completely new concept of “structure”.

At beginning, people were fascinated by many colourful dissipative structures in nature, such as waterfall, fountain, clouds, and many dissipative structures in science, in particular in chemical reactions.

As further development in recognition of the dissipative structure, a new and invisible dissipative structure of electromagnetic field composed of chaotic standing waves has been found.<sup>13-21</sup> The structure is to a great extent corresponding to the mysterious acupuncture system and is related to many puzzling phenomena of acupuncture, homeopathy and so-called energetic medicine. It sheds light on the transmission of signal along meridians and its speed, on the relationship between organs and acu-points and the effect of needling.

### **The Scientific and Quantitative Study of Harmony, Coherence and Wellness**

The reveal of the invisible dissipative structure of electromagnetic field, which is composed of an interference pattern of chaotic standing waves, is only a big step of recognition of acupuncture system and alternative medicine, but also a new chapter of physiology and physics. What is more, it offers a new method to evaluate instant status of a person, holistically and quantitatively.

#### **1) From “Harmony” in Ancient Medicine to “Wellness” in Modern Medicine.**

It is well known that there was a deep holistic view in many ancient medicines before development of modern science. However, the basic thinking in science, at least at the beginning of modern science was reductionism, that is, dividing a system into many small parts and studying them one by one. Reductionism was and is the base of the Western school of medicine along with the René Descartes’ “man is a machine.” This lead to dissecting a body into pieces smaller and smaller, going from organs to tissues, from tissues to cells, from cells to molecules until the bottom of reductionism – the molecule biology.

We have to admit that reductionism was extremely successful in the development of allopathic medicine, which saved countless lives. However, when we have arrived at the summit of reductionism and allopathic medicine of today, we find that we do not know how to be “fit as a fiddle” or how to achieve the “wellness.” Although we got to know all elements in of the body, we have missed the understanding of the relationship between these elements. Human beings have emotions and consciousness, which machines do not have. What is more, all these elements and consciousness have to work together in harmony in order to achieve the real wellness.

#### **2) Quantitative Evaluation of “Coherence”, “Harmony” and “Wellness”.**

However, the real situation is not so hopeless as it seems. The development of the concept of coherence in physics offers some hope and a practical way to understand the wholeness scientifically.

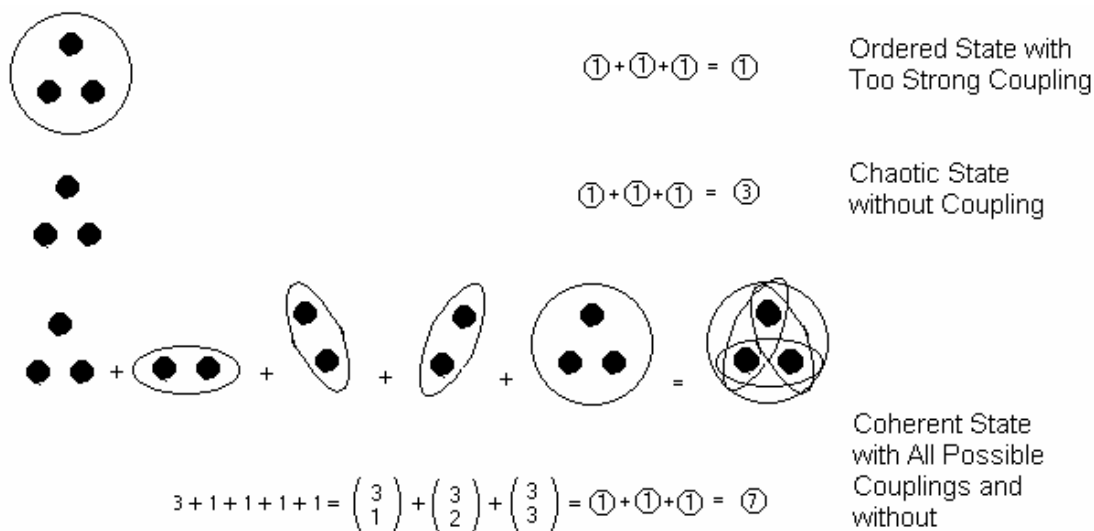
Originally, the word coherence meant being united, consistent or sticking together. In the development of laser technique, the word coherence was defined as being in the same frequency and in the same wave phase. In the study of living systems, the word of coherence can be defined as a state in which all elements keep their independence and have all possibilities to cooperate with others.

It should be stated that the two definitions of coherence in lasers and in living systems can be optically or electronically measured, and mathematically calculated. And the definition of coherence in living systems is quite close to the old concept of harmony and the modern concept of wellness.

In the light of the dissipative structure of electromagnetic field in living systems, the cooperation between elements in a system could be practically measured by means of evaluating the changes of wave spectrum through the increase of the number of beating frequencies which come from the couplings between oscillators, since most elements in a living system are oscillators permanently emitting electromagnetic waves forming the dissipative structure. 10,13 -19, 21.

The dissipative structure of electromagnetic field in a living system causes the heterogeneous distribution of electric field strength in it, which in turn causes the heterogeneous distribution of conductivity, that can be electronically measured on the surface of the living system.

The difference coupling relationship between elements (oscillators) can be simply explained with a three elements system ( see figure in this paper and the references 14, 18, 19 ). The consequences of difference couplings can be electronically measured and quantitatively calculated by statistics. A special instrument for such holistic and quantitative evaluation called “status analysis monitor” or “PPM instrument” is now already existing in the market.



**Figure. Three different coupling relationships between elements (oscillators) and their mathematical background in a simple three element system.**

### 3) Further Development of Medicine, Biology and Physics.

The recognition of the dissipative structure of electromagnetic field in living systems offers us not only some theoretical understanding of the common background of many complementary medicines but also a practical way of evaluating the wellness of a body-mind system and a method of monitoring the effect of holistic medicine. Moreover, it opens new chapters in physiology, biology and physics..

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